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BRITISH COLUMBIA BUREAU OF MINES

BULLETIN No. 1, 1915

PRELIMINARY REVIEW AND ESTIMATE

OF

MINERAL PRODUCTION, 1914

BY

WM. FLEET ROBERTSON, Provincial Mineralogist

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

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To the Hon. Sir Richard McBride,

Minister of Mines, British Columbia.

Sir,—I beg to submit herewith a preliminary estimate of the mineral production of the Province for the year 1914, together with some notes on the progress of the mining and metallurgical industries during the year just closed; the information herein presented is, of course, subject to revision.

The object of this preliminary estimate and review is to give as promptly as possible after the close of the year, an approximate statement of the condition of the mining interests, without waiting until the official returns from the mines have been received, and without the delay that of necessity must take place in carefully preparing the detailed information given each year in the Annual Report of the Minister of Mines.

I have the honour to be,

Sir,

Your obedient servant.

WILLIAM FLEET ROBERTSON,

Provincial Mineralogist.

Bureau of Mines, Victoria, B.C.,

January 18th, 1915.

PRELIMINARY REVIEW AND ESTIMATE

—OF—

MINERAL PRODUCTION FOR THE YEAR 1914.

THIS bulletin has been prepared before the receipt of the official reports for the year 1914 of the Gold Commissioners and Mining Recorders of the Province, and the customary returns of mineral production annually made by managers of mines and reduction-works; consequently, it must necessarily be regarded as being simply a preliminary review of the progress of the past year, together with an estimate of the quantities and value of the several mineral products of the Province, which it is believed will prove to be approximately correct.

The accompanying table shows an estimated mineral production during 1914 of a total value of $26,180,020. It will be seen that the total value of the production of 1914 as estimated is some $4,107,378 less than that of 1913, apparently a serious falling off, but in reality not as great as was expected in the face of the unprecedented conditions with which the mineral industry was confronted during the last half of the year. These conditions were brought about by the great European war, which so upset the metal markets of the world that quotations of prices for the more important metals were unobtainable for months. Such a condition was never before experienced, leaving no basis on which present sales of ores or metals could be transacted, or even the future values of these predicted.

Gold alone had a stable value, but the other metals that go to make up the mineral output of the Province are all such as America produces a large surplus of, which surplus had been disposed of in the European markets, and with the markets temporarily destroyed, the production of these metals was either stopped or materially curtailed.

Recently, however, since the eventual outcome of the struggle can be definitely predicted and Britain has obtained the undisputed command of the seas, the metal markets have been able to again resume business and to quote prices, these, however, being somewhat lower than previously prevailing.

It will be seen, therefore, that the conditions adversely affecting the Mining industry are but temporary and with their end within sight.

The production for 1914, although it is materially less than those for the years 1912 and 1913, is, nevertheless, about the same as for the year 1910, while it is considerably greater than that of any other year and is much greater than the average production for the last ten years.

The estimated decrease shown this year, while it is partially caused by a lesser quantity of the metals produced, is not entirely attributable to that cause, but is partially due to the lower average price of the metals prevailing in 1914 as compared with those of 1913.

For example, the average market value of silver in 1914 was about 4.9 cents an ounce lower than in 1913; copper was 2.27 cents a pound lower; lead, 0.5 cent a pound lower; zinc, 0.45 cent a pound lower.

If the metal prices of 1913 had been maintained during 1914 and applied to the output for that year, this output would have been valued at some $1,434,000 greater than it appears. The lower average prices for the metals prevailing in

1914 are partially attributable to the war, but to some extent were occasioned by the financial stringency which preceded the war and possibly foreshadowed it.

UNPRECEDENTED CONDITIONS IN 1914.

Conditions during the latter half of the year 1914 were unprecedented as regards their effect upon the production of minerals in British Columbia, which, however, as a result of the European war, was not alone in having experienced much difficulty in finding a market for its minerals.

It will be seen from the comparative table that follows, that, as compared with 1913, there is apparently an increase in the amount of placer gold recovered, but, as regards the lode minerals produced, with the exception only of zinc, there was a decrease in the quantity of each of the metals recovered, while even with zinc there is a decrease in value of the product, owing to the fact that the average market price of zinc was this year 10 per cent. lower than it was last year.

The total product of the collieries this year shows a decrease, which is found to have occurred entirely in the Crowsnest and Nicola fields—due to conditions brought about by the war—while the Vancouver Island collieries show an increase of nearly 10 per cent. over last year.

Owing to the fact that in most of the ores produced and treated in this Province several metals are associated, it follows, as a matter of course, that when curtailment of the production of such metals as lead and copper becomes imperative there must be a corresponding shortening in the production of the precious metals, since the greater proportion of the gold and silver produced under ordinary conditions is derived from such ores. For instance, fully two-thirds of the silver usually produced comes from the silver-lead ores of the Slocan District, so that when there is difficulty in marketing lead and its production decreases, it follows that the production of silver is adversely affected. Again, gold and silver occur with copper in the ores of the large mines of Boundary District, from which come rather more than two-thirds of the whole of the ore produced in the Province, so that here, too, the temporarily enforced curtailment of production of copper involves in degree a decrease in the output of gold and silver. There is reason, though, to look for early relief from these unfavourable conditions, and to hope for a return during 1915 to a normal state of the lode-mining industry.

PROVINCE'S PROPORTION OF PRODUCTION IN CANADA.

British Columbia's mineral production continues to be an important proportion of that of the whole of Canada, though not to as great an extent as in former years; not that our output has not increased, but on account of the comparatively larger increase in output of mineral that has taken place elsewhere in the Dominion, notably in Ontario, having had the effect of somewhat reducing the percentage of this Province in relation to the production of the whole of the Dominion. The aggregate value of the mineral production of British Columbia to the end of 1914 is, approximately, $486,000,000, but since the published official records of that of the whole Dominion do not include production prior to 1886, the present comparison must be restricted to the period of twenty-nine years—1886-1914. Placing the aggregate for all Canada at $1,645,000,000 (which allows for 1914 a Dominion total of $130,000,000, a decrease of about 10 per cent. from the total for 1913), and British Columbia's proportion for the same period at $421,000,000, the result is that this Province has to be credited with about 25.6 per cent. of the aggregate value of the mineral production of the whole of Canada in the twenty-nine-year period under review.

It is a striking fact, as indicating the substantial increase in the value of the mineral production of the Province in recent years, as compared with that of less than twenty years ago, that nearly 33 per cent. of the $421,000,000 mentioned above as the aggregate production of twenty-nine years is to be credited to the last five years, 1910-1914, while more than 50 per cent. was produced during eight years, 1907-1914.

MINERAL PRODUCTION FOR TWO YEARS, 1913-1914.

The following table shows the quantities and value of the several minerals produced in the year 1913, and the estimated production in 1914. It may here be explained that the prices used in calculating the estimated value for 1914 of silver, lead, copper, and zinc are the average prices for the year, as published in *The Engineering and Mining Journal*, New York, less a deduction of 5 per cent. off silver, 10 per cent. off lead, and 15 per cent. off zinc.

	Production, 1913.		Estimated Production, 1914.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer	.....	$ 510,000	.....	$ 524,000	$14,000	.....
" lode ..... oz.	272,254	5,627,490	246,936	5,104,126	.....	$523,364
Total gold	.....	$6,137,490	.....	$5,628,126	.....	$509,364
Silver ..... oz.	3,465,856	1,968,606	3,294,752	1,768,666	.....	199,940
Lead ..... lb.	55,364,677	2,175,832	52,424,732	1,834,866	.....	340,966
Copper ..... "	46,460,305	7,094,489	44,968,541	5,845,910	.....	1,248,579
Zinc ..... "	6,758,768	324,421	7,029,276	309,288	.....	15,133
Total metalliferous	.....	$17,700,838	.....	$15,386,856	.....	$2,313,982
Coal ..... tons, 2,240 lb.	2,137,433	7,481,190	1,821,306	6,374,578	.....	1,106,612
Coke ..... "	286,045	1,716,270	257,931	1,427 586	.....	288,084
Building materials, etc.	.....	3,398,100	.....	3,000,000	.....	398,100
Total value of production	.....	$30,296,398	.....	$26,189,020	.....	$4,107,378

PRODUCTION OF VARIOUS MINERALS BRIEFLY REVIEWED.

In order to indicate in a general way the sources of the various minerals mined in the Province and to give an idea of some of the conditions that affected their production, and, incidentally, brief information concerning the larger known mineral deposits occurring in British Columbia, the next following comments are submitted.

Gold.

Placer Gold.—The estimated recovery of placer gold for 1914 is $524,000, of which practically all is obtained in the Cariboo and Cassiar Districts, only about one-twentieth of the total coming from the other districts. An approximate apportionment is as follows: From Cariboo District, $155,000; Atlin Division of Cassiar District, $322,000; Stikine and Liard, $23,000; remaining parts of the Province, $24,000. It may be that for both Carboo and Cassiar Districts a larger yield will be shown, but this cannot be definitely stated until after the final returns of the season's operations shall have been received.

In the Cariboo District, while water was running before the end of April, it was not until May that a full head was available for the hydraulic mines. The winter's snowfall had been lighter than that of the previous season, but weather conditions in the spring and early summer of 1914 were favourable to a gradual melting of the snow; consequently, but little water ran to waste. A dry autumn, however, shortened the length of the gravel-washing season and so kept down the yield of gold. Notwithstanding the disappointing nature of the latter part of the season, it is believed that about as much gold was recovered as in the 1913 season, and possibly more.

No particulars of the mining operations in the Quesnel Division or the amount of gold recovered in Omineca Division have been received, yet it is known that in

both of these Divisions there was at least as much activity as during the previous season, and that a beginning to wash gold-bearing gravel was made by one company operating in the latter.

From Atlin Division of Cassiar District reports indicate that, on the whole, results were better, and that the total yield of gold from Atlin creeks was higher in 1914 than in 1913. There was a generally abundant fall of snow in the winter and the water-supply was augmented by fairly copious rains in summer, so that on most of the creeks there was all the water needed for operating, and consequently results were good where mining was done throughout the season. Operations on individual creeks will be briefly stated later.

In the Stikine-Liard Divisions the interest shown in the previous season was maintained; the Boulder Creek Hydraulic Company had a profitable season, and it is understood other operators were in some measure encouraged to continue their efforts.

Activity in a small way was reported from several parts of Kootenay and Yale, but the most noticeable advance appears to have been that made on Granite creek and Tulameen river, in Similkameen Division. It is reported that some gold was recovered on several placer leases on Granite creek, and that progress was made in preparation for placer-mining on the Tulameen river between Princeton and Granite creek, while above Tulameen City encouraging prospecting results were obtained by several parties, either on the main river or on tributary creeks.

Lode Gold.—The quantity of lode gold produced seems to have been less than in either 1913 or 1912. The estimated decrease is nearly general as regards the mining divisions from which most of the lode gold usually comes, the one exception being Trail Creek Division, but even in that instance the small increase estimated, of only about 3,000 oz., falls short of what was expected, having in mind that it was common report throughout last year that the general gold-tenure of ore from the Rossland mines was higher than it had been. As a matter of fact, the average gold content of the ores sent to the smelter from the Consolidated Mining and Smelting Company's mines, as shown in the company's printed annual reports for the fiscal periods ended September 30th, 1913 and 1914, respectively, was a little lower in the latter than in the former period. Beside, there was a short suspension of operations at the Le Roi No. 2 Company's *Josie* group, which caused a decrease of about one-sixth in the quantity of ore and concentrate shipped in 1914 from that property to Trail, as compared with the total for 1913, and which affected the output of gold to an amount of between 2,000 and 2,500 oz. The total from Rossland mines has been estimated at about 140,000 oz. for 1914, as compared with 137,000 oz. for 1913. The Consolidated Company's *Centre Star* and *Le Roi* groups of mines are credited with an output of 128,000 oz., and the *Josie* group of the Le Roi No. 2, Limited, with 12,000 oz.

The decrease in lode gold from mines in the Nelson Mining Division is estimated at approximately 11,000 oz., but the position may be improved when the returns come in. Much of the loss in production is attributable to a suspension of ore-shipping from the *Yankee Girl* mine, near Ymir, while the closing of the *Arlington* mine, in Erie camp, cut off another source of production. As the *Granite-Poorman* mill was not operated until late in the year, there was little gold recovered in 1914 from that group of mines; nor was there any appreciably large production of gold from other mines in the neighbourhood of the city of Nelson. The chief gold-producing mines in the southern part of the Nelson Division are the *Motheriode* and *Queen*, in Sheep Creek camp, while the *Relief* mine, in Erie camp, adds a much smaller quantity from that part of the district. Developments on the 600-foot level of the *Queen* mine continued to be most satisfactory, the quartz ore-body at that depth having been stoped up to a width of 85 feet.

The decrease of lode gold from the Boundary District appears to have exceeded 17,000 oz. There was an increase of more than 3,000 oz. from the *Jewel* mine, in Greenwood Division, but a decrease of probably six times that quantity from the copper-gold mines of the Granby Consolidated and British Columbia Copper Company's. Of course, this was occasioned by the stoppage of mining and smelting after

the outbreak of the war, so the loss in production will not be permanent. At the Hedley Company's *Nickel Plate-Sunnyside* mines, in Osoyoos Mining Division, there was an increase in output of ore by about 7,000 tons, but the total recovery of gold was less by 2,000 oz., the average gold content of the ore having been lower, as was forecasted by the company's general superintendent that it would be, in his annual report for the year 1913. The decrease from mines in the Coast District was caused chiefly by war conditions necessitating a suspension of production at the *Marble Bay* gold-copper mine on Texada Island. However, the outlook for a larger output of lode gold from Coast mines is promising when the present interruption to mining shall be removed.

Silver.

The quantity of silver produced seems to have been about 3,395,000 oz., only 71,000 oz. less than in 1913, and was greater than any other year since 1905.

The approximate quantities estimated from the various mining regions were, with those for 1913 in parentheses, as follows: Slocan and Slocan City, 1,598,000 oz. (1,841,000); East Kootenay, 492,000 oz. (367,000); Ainsworth, 349,000 oz. (447,000); Boundary, 329,000 oz. (305,000); Nelson, 148,000 oz. (129,000); Rossland, 134,000 oz. (110,000); Omineca, 118,000 oz. (46,000); Coast, 90,000 oz. (103,000); Trout Lake and Revelstoke Divisions, 11,000 oz. (23,000); Skeena, 131,000 oz. (5,000). There will be minor changes in these figures, but it is not expected that there will be any important variation from them.

The Slocan again leads in the production of silver, having come within about 105,000 oz. of one-half of the total production. Indeed, if Ainsworth be included as a part of the Slocan District, as it often is, then more than one-half is to be credited to this district. Given normal conditions as to market, both Ainsworth and Slocan Divisions are in a position now to make a larger output of silver, lead, and zinc than in any of a number of other recent years.

Among the Slocan mines, the *Standard* was first, with a production of more than half of the year's output of silver from the mines of that district; there were several others also that produced more than 100,000 oz. each—namely, the *Rambler-Cariboo*, *Van-Roi*, *Slocan Star*, and probably the *Hewitt*. Of the Ainsworth mines, the Consolidated Company's *No. 1* was highest with 155,000 oz., to which was added 60,000 oz. from other mines in that camp operated by the same company, and a fairly large quantity from the *Bluebell*, with the *Utica* and J. L. Retallack & Co.'s *Whitewater* property also producers.

From the *Sullivan* group, in East Kootenay, the Consolidated Company obtained 475,000 oz., and 18,000 oz. from its *St. Eugene* mine. In the Nelson Division the *Silver King's* proportion was 107,000 oz., and that of the *Molly Gibson* about 24,000 oz. An estimate of the output of Rossland mines gives the *Centre Star* group 60,000 oz.; the *Le Roi*, 48,000 oz.; and the *Josie* group, 25,000 oz. The Granby Consolidated Company's mines at Phoenix yielded about three-fifths of the silver-output of Boundary District, with the British Columbia Copper Company's *Mother Lode* and *Rawhide* mines, the *Jewel*, and the *Union*, in Franklin camp, making up nearly all of the remainder.

In the Hazelton region of Omineca Division, the *Silver Standard* was a long way ahead of other mines in that part of the Province, with a total of well over 100,000 oz. In the Coast District the largest amounts were 70,000 oz. from the *Britannia*, in Vancouver Mining Division, and 17,000 oz. from the *Marble Bay*, on Texada Island.

It is to be expected that the Granby Consolidated Company's *Hidden Creek* mines will in future add a substantial amount of silver to the yearly production; their 1914 output of this metal was about 131,000 oz.

Lead.

Up to the time of the declaration of war it looked as if the 1913 output of 55,000,000 lb. of lead—the highest annual production in the Province in eight years—would be exceeded in 1914. For the six months ended June 30th the average quantity

of lead received at the smelting-works at Trail had been 4,360,000 lb. a month; then came July's total of 5,082,000 lb., followed by 5,082,000 lb. in August, which last-mentioned amount in being smaller showed the effect of the closing of several of the mines during that month. The remaining months of the year did not see a return to ordinary output conditions of the mines in Ainsworth, Slocan, and Nelson Divisions, though there was an increase in lead-ore receipts from the Sullivan group, East Kootenay, owned by the Consolidated Company, which to a considerable extent compensated for the decrease in those from the other parts mentioned. The total lead produced can not be placed at more than 52,425,000 lb., which was 2,940,000 lb. short of the production in 1913. Under the circumstances, it is a matter for congratulation that the falling-off in output was not greater.

Of the 52,425,000 lb. estimated as the production for the year under review, 24,863,000 lb. was the product of East Kootenay mines—24,183,000 lb. from the *Sullivan* group and 680,000 lb. from the *St. Eugene*—and 25,067,000 lb. from Ainsworth and Slocan mines. The proportion from Ainsworth Division was 8,110,000 lb., contributed by a dozen mines, in largest degree from the *Bluebell* and *Highland*, and next from the *Maestro*, the quantities from other mines having been comparatively small. Of the production from Slocan Mining Division, the total from which was about 16,958,000 lb., about three-fourths was from the *Standard* mine, from which, however, no silver-lead product was shipped to the smelter after the first week in August. The output of the *Slocan Star* was about 1,185,000 lb., and that of the *Rambler-Cariboo* 1,570,000 lb.; next in order of quantity produced was the *Van-Roi*, followed successively by the *Surprise*, *Ruth-Hope*, *Silverton* mines (*Hewitt-Lorna Doone* group), *Richmond-Eureka*, and *Wonderful*, with productions ranging from 650,000 lb. down to 100,000 lb. Including three in Slocan City Division, there were over a dozen smaller producers.

Nelson Division had a total of about 1,992,000 lb., the approximate proportions of which were: From *H.B.* mine, 783,000 lb.; from the adjoining *Zincton* mine, 268,000 lb.; from the *Emerald*, also in the neighbourhood of Salmo, 800,000 lb.; and from the *Molly Gibson*, at the head of Kokanee creek, 111,000 lb.

The *Silver Standard*, near Hazelton, Omineca Division, sent to Trail ore containing about 282,000 lb. of lead, and the small output of two other mines, also situated within a few miles of the Grand Trunk Pacific Railway, constituted the remainder of the amount shown as from this part of Cassiar District.

Comparatively small shipments were made from Trout Lake and Revelstoke Divisions, estimated together to have contained about 129,000 lb. of lead. That from Revelstoke was from the *Lanark* mine, first worked many years ago.

Beside the decrease in quantity of lead produced, there is the lower price to add to the disadvantage to which this part of the mineral production shows for 1914. In this connection there was a loss of more than $225,000.

Throughout nearly the whole of the calendar year the London price for lead was above that at which the Dominion Government bounty on lead ceases to be paid, so that the unearned balance of the original appropriation of $2,500,000, made about a dozen years ago, remains at almost as much as it was at the beginning of 1914, when it was stated to have been between $500,000 and $600,000.

Copper.

The amount of copper estimated to have been produced in the Province during the year 1914 is 44,068,541 lb., worth $5,845,910.

It is an agreeable surprise to find that the preliminary estimate of the quantity of copper produced in 1914, as compared with 1913, shows only the comparatively small decrease of 1,492,000 lb. The explanation lies in the fact that the operation of the Granby Consolidated Company's *Hidden Creek* mine and its smelting-works at Anyox, in Skeena Mining Division, resulted in the production of copper to an extent that largely offset the decrease that resulted from the suspension of production from Boundary District mines. Indeed, had it not been for a decrease of about 1,167,000 lb. at the *Britannia* mine, in Vancouver Mining Division, and of more than 300,000 lb. at the *Marble Bay* mine, on Texada Island, in each case the result of war

complications, the year's output, augmented by production from the new source above mentioned, would have been at least as large as that of 1913, and this despite the considerable loss in production in Boundary mines, which are estimated to have produced in 1914 less copper than in 1913 by fully 12,000,000 lb.

The reduction in average market price, from 15.27 cents in 1913 to 13 cents in 1914, made a difference of $1,021,500 in the value of the total quantity of this metal produced in the Province in the latter year.

The copper production of the several districts was, approximately, as follows: Coast District and the Skeena Division of Cassiar District, 28,900,000 lb.; Boundary District, 10,400,000 lb.; Trail Creek Division (Rossland mines), 3,984,000 lb.; Nelson Division, 670,000 lb.

While the output of the *Britannia* mine was restricted, by reason of market disturbances as a result of the war, to about 12,000,000 lb. of copper, and that of the *Marble Bay* mine to 771,000 lb. for the same reason, it is satisfactory that at both mines preparations were continued for an enlarged output after present difficulties shall have been overcome.

In Boundary District both mining and smelting were resumed by the Granby Company in December, though on only a small scale. By the end of the year, however, four blast-furnaces were in operation at the company's smelting-works at Grand Forks, and it was stated that it was probable two more would shortly be in blast. While this resumption of work came too late in the year to favourably affect production figures, it is noteworthy, and this evidence of returning activity in copper-mining in Boundary District is a source of gratification.

The Boundary District copper-mines have been continuously productive for fifteen years, and still possess substantial ore reserves. The Granby Consolidated Company's annual report for the fiscal year ended June 30th, 1914, showed that at that date its "balance of developed ore" in its mines in Phœnix camp was 4,601,531 tons, which, at a similar rate of production to that of recent years, gives an ore-supply for nearly four years, and this without making allowance for the possible discoveries of other ore-bodies in the company's extensive area of mineral-bearing ground near Phœnix. Again, a year ago the British Columbia Copper Company reported having "about two years' supply of available ore" in the *Mother Lode* mine; also that, as a result of disclosures by diamond-drilling in the territory to the south of the shaft, "the present indications are that commercial ore-bodies of exceptionally good grade exist here."

It appears that the ore mined at Rossland in 1914 had a higher average copper content than that produced in 1913. This fact, together with a greater quantity of ore produced, accounts for a relatively large increase in copper from Rossland mines, as compared with 1913. It may be well to note that the president of the Consolidated Mining and Smelting Company of Canada, Limited, in his annual report, published quite recently, made this reference to the big mines at Rossland: "The development work at the Rossland mines is very encouraging." Evidently the management of the company is satisfied with conditions at the Rossland mines; further, the company has been, and still is, altering and improving its copper-smelting plant at Trail. The company produced in 1914 487,238 lb. of copper from ore from the *Silver King* mine, near Nelson; up to the time of suspension of ore-shipments in August, against 142,351 lb. during the part of 1913 it operated that mine. The *Queen Victoria* mine, also near Nelson, is estimated to have produced 182,000 lb. of copper during the period it was worked by the British Columbia Copper Company in 1914.

Reverting to the question of copper production on the Coast, the Britannia Mining and Smelting Company, Limited, has been for two years making extensive preparations for an enlarged production of copper ore, its plans including provision for an output of 2,000 tons a day.

While the output from the *Marble Bay* mine, on Texada Island, does not ordinarily exceed 100,000 lb. of copper a month, the mine has been a regular producer for a number of years. It is of interest, consequently, to find that shaft-sinking is in progress with the object of opening the ground at 500 feet below the

present tenth level and 200 feet deeper than the thirteenth level, which is reached by a winze from the tenth level. This deeper development-work was decided on after the occurrence of ore down to that depth had been proved by diamond-drilling.

The operations of the Granby Consolidated Company near Anyox, Observatory Inlet, constitute the greatest development in copper-mining yet known on the Coast. In his report for the fiscal year ended June 30th, 1914, the general manager included the following statement: "The work of opening the *Hidden Creek* mines and developing the ore-bodies during the last three years has been conducted in a thorough, systematic, and efficient manner, making those ore-bodies easily accessible for future mining operations in producing ore for the smelter. The further development of the mines this year has continued the good showing of the work of previous years; the diamond-drill work and extension of drifts and raises has materially increased the quantity of ore of a grade of 2.2 per cent. copper (as well as that of a lower grade), present estimates indicating 9,563,500 tons, or 1,806,950 tons more than was reported at the close of the last fiscal year. In addition to this, there is estimated a quantity of 8,589,500 tons, showing an average copper content of 0.6 per cent. While the average copper content of that ore is taken as at 0.6 per cent., there is much ore included that contains 1 or 1.25 per cent. copper which may be mined with the higher-grade ore and smelted in the blast-furnaces." Other statements also contained in the annual report are that at its *Hidden Creek* mines the company may mine 18,153,000 tons of ore running 1.4 per cent. copper and having also a gold and silver value amounting to about 30 cents a ton. The mining cost will be approximately $1 a ton when mining from 1,500 to 2,000 tons a day of average mine-run. As the stopes shall be further opened and enlarged, the mining cost will decrease. The mine superintendent's report includes the information that since smelting was started at Anyox there had been shipped from the mine 77,377 tons of ore containing 2.4 per cent. copper. A larger quantity of ore had been mined than could be taken at the smelter, so that there was then 15,000 tons of broken ore in the mine.

The development of promising deposits of copper ore on Rocher Déboulé mountain, in Omineca Mining Division, and the provision made for transportation purposes between mine and railway are features of progress in that part of the Province, and indications of preparations for another addition being made to its copper production.

While the money value of the products of the large mines in which the ore is of comparatively low grade is not nearly so great as in the cases of gold and silver mines yielding, it may be, a great deal higher value, yet it should be kept in mind that the ore-shoots of the latter are usually very much smaller, so that, viewed from the standpoint of greater benefit to the country through the employment of far larger numbers of miners and smelter-men, and the complementary benefits in employment of many more men in railway transportation and the mining of coal and making of coke, the possession and operation of large low-grade mines is a decided advantage to a country. And, after all, it is the industry that gives employment to many men that makes most for the substantial advancement and prosperity of the country; hence the prominence given in this review to copper-mining.

Zinc.

The quantity of zinc shown as having been produced in 1914, 7,020,276 lb., is the largest for any of the last five years. While the increase over the production of 1913 is only about 271,000 lb., taking into consideration the fact that conditions were unfavourable during several months of the latter half of the year for mining and concentration of silver-lead-zinc ores, from which most of the zinc usually produced in the Province is derived, it is pleasing to find that even the comparatively small increase shown above was made. Despite this increase in the quantity of the metal produced, the fact that the average market price was this year 0.45 cent, or 10 per cent. less than in 1913, so reduced the value of the product that it appears less than that of last year by some $15,000.

Zinc was produced in three mining divisions of West Kootenay; considerably the largest part came from mines in Slocan Division, and in much smaller amount

in Ainsworth and Nelson. The estimated production from the *Standard* mine is 4,000,000 lb.; doubtless the output from this mine was curtailed owing to the silver-lead product from the ore milled having to be stored to await higher prices and less disadvantageous terms than prevailed after July.

Other producers of zinc, also situated near Silverton, were the *Hewitt-Lorne Doone* group, owned by the Silverton Mines, Limited, and the *Van-Roi*. The operations of the latter were interrupted during the year, but the mill of the former, after adjustment of the Minerals Separation Company's flotation process to the requirements of *Hewitt* ore, was for some time carried on to the full capacity of the mill plant. The *Hartney*, near New Denver, was a small producer, while the *Rambler-Cariboo* and the *Slocan Star* added about 608,000 and 500,000 lb. respectively to the total for this metal. The *Surprise* is not included in the list of producers, but late in the year it commenced to ship lead-zinc ore to the *Ivanhoe* mill at Sandon. Arrangements were advanced in December for again getting out zinc ore from the *Lucky Jim* mine.

In Ainsworth Division J. L. Retallack & Co.'s *Whitewater* group of mines and the *U.S.* and the *Utica* each produced zinc, but in smaller quantity than may be expected under normal conditions. Work was resumed at the *Cork-Province* mill toward the end of the year, but no zinc product was shipped. The outlook for a larger production of zinc from mines in this Division is promising.

A new departure was the shipment of carbonate of zinc ore from the *H.B.* and *Zincton* mines, near Salmo, in Nelson Division. As there is a large deposit of this ore on these adjoining properties, a considerable increase in output in the early future may be expected.

W. R. Ingalls, the well-known authority on zinc, in reviewing the metallurgy of zinc in 1914 in the *Engineering and Mining Journal* of January 9th, 1915, says, as to the hydrometallurgy of zinc: "At any given time in the last twenty years it is safe to assume that experiments with the hydrometallurgical processes of zinc-extraction are going on at three or four places, and 1914 was no exception. The work at Bully Hill, California, was checked, but only temporarily, the metallurgists of that company apparently thinking well of the results so far. Some plans regarded as promising are also being carried out by the Consolidated Mining and Smelting Company at Trail, B.C. Both at Bully Hill and at Trail the idea is to sulphatise the zinc and electrolyse the solution." As regards the electric smelting of zinc, he says: "The experimental work at Nelson, B.C., was discontinued, it being regarded as conclusively settled that an electric zinc-smelting furnace so small as one ton of daily capacity is a commercial impossibility, while the satisfactory development of a larger furnace was regarded as too doubtful to be undertaken at Nelson."

Other Minerals.

Some prospecting for and development of bodies of iron ore has been going on this past season on the Zymoetz river and at other points on Coast and in the Interior, but no iron ore has been used or shipped.

A small quantity of crude placer platinum has been recovered on the Tulameen river, in the Similkameen Division, estimated at less than $1,000 in value. This was obtained from prospecting workings being carried on, and the results are considered encouraging.

It is of interest to note the fact that the mineral molybdenite has been discovered, in what appears to be commercial quantities, at the head of Lost Creek, some fifteen miles from the town of Salmo, in the Nelson Mining Division, two carloads of the mineral has been mined and taken to Salmo for shipment. The deposit would appear to be of considerable size, but, judging from the samples sent to this Department by the owners, the material will require to be concentrated to bring it up to the market requirements of about 85 per cent. molybdenite.

Prospecting for petroleum by means of boreholes has been in progress in South-East Kootenay, on the Queen Charlotte islands, and elsewhere, but oil in commercial quantities has not yet been encountered.

Coal and Coke.

It is estimated that the gross production of coal was 2,172,530 long tons, of which 351,222 tons was made into coke, leaving the net production at 1,821,308 tons. These figures show a decrease, as compared with 1913, of 398,280 tons gross and of 316,175 tons net. The quantity of coke made was nearly 238,000 tons, which is a decrease of about 48,000 tons as compared with 1913. For purposes of comparison the following table is shown:—

	Est. 1914.	1913.	1912.	1911.	1910.	1909.
Coal, gross.....tons, 2,240 lb.	2,172,530	2,570,760	2,035,709	2,297,718	2,139,185	2,460,900
Less made into coke "	351,222	439,377	288,905	104,656	289,139	304,124
Coal, net ..... "	1,821,308	2,137,483	2,038,804	2,193,062	2,800,046	2,056,676
Coke made..... "	237,951	286,045	264,286	68,005	218,089	266,706

In these figures the output for the month of December has had to be estimated, consequently the final figures may vary from them slightly.

Production was not interfered with to any appreciable extent, if at all, by labour troubles in 1914. In fact, it was claimed that much more coal could have been produced had there been demand for it. There is no doubt that all there was a market for was produced. Unfortunately, though, less coal than usual was required from Vancouver Island mines for bunkering purposes, the state of war having considerably lessened the demand. The activity of German cruisers that sought to destroy the shipping of the allied powers at war with Germany for a period of four or five months interfered with the steamship trade to which Vancouver Island collieries ordinarily look for a considerable portion of their market. The destruction in December of those of the enemy's war-ships that had disturbed the mercantile service removed this menace to shipping. Again, the competition of fuel-oil continued to be felt, though not in larger degree than in 1913.

On Vancouver Island the Canadian Collieries (Dunsmuir), Limited, worked its mines at both Cumberland and Extension. The large improvements at Cumberland so far advanced in 1913 were completed, this including the substitution of electric power for steam, underground development, the betterment of the railway system between the mines and Union bay, and generally, adequate provision for a considerably enlarged output of coal. However, market requirements did not call for this larger production capacity of the Comox Colliery being fully drawn on, though all the coal that could be sold was got out. Negotiations that it was hoped would result in a resumption of coke-making at Union bay were carried on for a time, but nothing definite in this direction was done before the year closed. At the Extension Colliery satisfactory progress was made, for new electric locomotives were obtained to replace those destroyed during the strike, new surface buildings were erected, and much work was done underground, so that the mines of this colliery were restored to normal producing capacity, which is now about 1,000 tons a day, as compared with 250 to 300 tons a year ago. The company's output of coal in 1914 from both Cumberland and Extension mines was a little more than 533,000 tons.

The Western Fuel Company had not, in the early part of the year, overcome the effects of the strike of the year before, yet as the months passed an excellent showing was made by the company's No. 1 mine, Esplanade, Nanaimo, in which the haulage system from the foot of the shaft to the North Side workings was improved and the producing capacity here increased 60 to 70 per cent., so that an output of 303,000 tons of coal was made. No work was done in the Northfield (Brechin) mine, which may be abandoned. At the Reserve mine, four miles south of Nanaimo, the two 1,000-foot shafts, sinking of which was commenced in 1910, were completed and tunnels of about 200 feet in length were driven back to the coal-seam. A ventilation system was established and the work of making a connecting heading in the coal was undertaken. The coal, which is the Douglas seam, where cut was 14 feet in

thickness; clean, firm, and of good quality. It is expected that the production of coal from this mine will be up to 1,000 tons a day in the latter part of 1915, and that afterward it will be increased to double that quantity.

There was little change to note at the South Wellington Colliery of the Pacific Coast Coal Mines, Limited, but at the company's Mordon mine, two miles east, a reinforced-concrete and steel tipple was constructed, modern machinery installed, and the pit-head generally completed along up-to-date lines. Two shafts were sunk here in 1912-13, and an 8-foot seam of coal was reached at a depth of 600 feet. In its mine at Suquash the same company completed in 1914 a new shaft and slopes to connect with the older workings. The year's output from all of this company's mines totalled nearly 128,000 tons.

The Vancouver-Nanaimo Coal Company, working the Jingle Pot mine, near Nanaimo, produced about 106,000 tons of coal in 1914.

In Nicola valley the production of coal was, approximately, as follows: Middlesboro Colliery Company, 60,000 tons; Inland Coal and Coke Company, 53,000 tons; Pacific Coast Collieries Company, 500 tons; total, 116,500 tons. The competition of fuel-oil was felt by these companies, it having resulted in a much decreased demand for use of coal on railways on which previously Nicola coal had been burned in the locomotives.

In Similkameen District the Princeton Company made a production of 17,500 tons, and the Coalmont Colliery commenced to send out coal, but not having suitable transportation facilities its output was only 4,000 tons.

In South-East Kootenay the Crow's Nest Pass Coal Company's output was 780,000 tons, that of the Hosmer Mines, Limited, 118,000 tons, and of the Corbin Coal and Coke Company, 74,000 tons. Of this district output of 972,887 tons (2,240 lb.), some 351,000 tons was made into coke, of which the Crow's Nest Pass Company produced nearly 208,000 tons and the Hosmer Company 35,000 tons. The Crow's Nest Pass Company did new work and made additions to plant and equipment at both its Coal Creek and Michel Collieries; at the former chiefly at its No. 1 East mine, the new B mine, and the old No. 2 mine, and at the latter at the new No. 8 mine and on No. 3 and two new seams also on the south side of the valley. The Hosmer Colliery was closed last summer, with no present intention of reopening it. The Corbin Company did much more surface stripping on what is known as its No. 3 mine, or the "Big Showing." A Marcus screen was added to the equipment of this colliery.

Summarizing the Provincial production of coal, the following table shows the output:—

	Tons of 2,240 lb.
From Vancouver Island mines	1,064,913
From Nicola and Similkameen mines	135,230
From Crowsnest mines	972,887
Total quantity of coal mined	2,172,530
Less made into coke	351,222
Net quantity of coal produced	1,821,308

Beyond some further prospecting, there was little done toward the development of the various coalfields in the Province that have not yet been productive in a commercial way. These fields include the coal-measures of the Upper Elk River District, in South-East Kootenay; those of the northern part of Cariboo District; of the North Thompson River valley; of the Groundhog Mountain basin, in northern Skeena; and of parts of the country traversed by the Grand Trunk Pacific Railway.

Structural Materials, Etc.

The output of all structural materials, such as cement, lime, building-stone, brick, and other clay products, is much less this year, due to the cessation of building operations brought about by the uncertain financial outlook and scarcity of money for investment and later by the war.

The value of all such materials produced in 1914 is estimated to be about $3,000,000, a serious decrease from the preceding year, but not as great as it would have been but for the large Government contracts being carried on at Victoria at the breakwater and piers at Outer Wharf, which required a large amount of stone.

The marble-quarry in the Ainsworth Mining Division is still being developed, but it is not known that any appreciable output was made.

Two new marble-quarries were opened up on the southern end of Texada island, but it is too soon as yet to expect anything more than sample shipments.

Sample slabs from one of those quarries sent to the Provincial Museum show a marble very pleasing to the eye and of excellent quality, hard, and taking a good polish.

The other quarry is known to have sent at least one scow-load of large blocks to Vancouver—presumably to be slabbed—but no information is as yet available as to the results obtained.

The output of cement has suffered from the market being restricted by the curtailment of building operations. The two Portland-cement plants on Saanich inlet, near Victoria, while they both made large outputs, all the market would absorb, did not produce as much as last year.

The cement plant started near Princeton has ceased to operate.

MINING DISTRICTS OF BRITISH COLUMBIA.

In order to give a general idea of the mineral deposits, mines, and reduction-works of British Columbia, a summary of these, together with an outline of the chief features of the operations during 1914, will now be presented. As the mining districts are numerous and cover a large area of territory, the information that follows is, necessarily, incomplete, for it is not practicable, in a general review, to give particulars of all that should have notice. The various districts and their respective subdivisions will here be briefly dealt with and in the order in which they usually appear in the Annual Reports of this Department.

CARIBOO DISTRICT.

Three mining divisions are usually included under the general head of Cariboo District—namely, the Cariboo, Quesnel, and Omineca Divisions. In the first two divisions mining operations are restricted almost entirely to placer-mining, there being little, if any, other productive mining, but in the Omineca Division lode-mining is now much more important than placer-mining. Doubtless this extensive area possesses great potentialities in its undeveloped lode-mineral resources, and in smaller degree, perhaps, in coal, but the fact that, heretofore, it has been entirely without railway transportation facilities has been an effective bar to the utilisation of those resources. However, railway-construction through the extreme northern portion of the district has been completed and has to a considerable extent benefited it, and as the construction is in progress of a railway from the south which will eventually give rail connection with tide-water in one direction and the Grand Trunk Pacific transcontinental railway in the other, there is good reason to look for a removal, possibly within a year or two years, of this chief disability under which the district has so long laboured.

Mention has already been made, under the subhead of "Placer Gold," of the conditions affecting mining in this district last season—that the snowfall of the previous winter had been comparatively light, that the snow melted gradually in spring and early summer, and that a dry autumn made the gravel-washing period shorter than usual. Notwithstanding these drawbacks, however, the recovery of gold was somewhat greater than in 1913. The following notes give some brief particulars of the season's work:—

Cariboo Mining Division.

The several properties known as the John Hopp mines—namely, the *Stouts Gulch*, *Lowhee*, and *Mosquito Creek* hydraulic placer mines—were worked as usual. It is reported that at the *Stouts Gulch* mine the gravel washed had a good average gold content, and that the results of the season's work were satisfactory, while the prospects were, when shortness of water necessitated a suspension of hydraulicking for the season, that next season's run will also give good returns. At *Lowhee* the main clean-up was stated to have been good, though the total value recovered was not quite so high as was expected. There was no autumn clean-up, so little rain having fallen that there was not enough water available during the latter part of the season to move the gravel believed to run well in gold. The dam at Ella lake proved very serviceable, allowing of the flow of water being regulated. This dam was raised in 1914; it now has a height of 80 feet. The season at *Mosquito Creek* was short, but a satisfactory clean-up was made, although here, also, the dry autumn unfavourably affected the total of gold recovered.

The Point mine, on Slough creek, had a better season than in 1913, and the *Waverly* mine is said to have more than paid expenses. The mines on Nugget gulch and China creek were unworked.

Testing the gravel on Williams creek and Willow river to ascertain whether it would be suitable for dredging was continued. While results were not made public, it is hoped they were sufficiently good to encourage those directly concerned to acquire the ground and undertake this enterprise.

A small number of men were employed on Shepherd creek, near Eight-mile creek, and obtained prospects that promise well for future seasons. Work was done on the property of the Lightning Creek Company, near Stanley, and on that of the West Canadian Deep Leads, on Little valley, but no particulars were obtained.

Many claims were staked in the neighbourhood of Fort George, and others about Tete Jaune Cache, but of these little is yet known.

On the whole, the outlook for the future is better than for years, and now that the transportation problem will soon be solved the mineral production of Cariboo Division may be expected to be increased.

Quesnel Mining Division.

Mining in this Division has, as yet, been confined to placer-gold working—chiefly hydraulicking; the old "Hobson properties" at Bullion and on Spanish creek, the Quesnel Hydraulic Mining Company, and several others being in this Division, as are also a number of smaller properties in the Keithley Creek section which have been working and producing in small amounts for many years.

The larger hydraulic properties have not been operated this past season, some of them being tied up by litigation, while all are waiting until the railway through the district has reduced freight charges.

Keithley creek will have made some output, and some will have been made in the Harpers Camp section, and some gold will have been recovered by the several Chinese partnerships that for years have made headquarters at Quesnel Forks and each year operate in a small way.

It is known that a number of men have been working on the Coldwater river, just east of and over the divide from the east end of Quesnel lake, but no news has been received as yet as to the results obtained.

For years past samples of lode minerals have been found at various points in the Division, but without railway transportation these were of no value.

Now, however, that this obstacle has been removed by the building of two railways through the Division, it is expected that the prospecting and development of these lode-mineral properties will be energetically carried on.

Omineca Mining Division.

The Omineca Mining Division, with recording office at Hazelton, is probably the largest in the Province. Its varied mineral resources are briefly indicated in the following notes:—

Omineca River Region.—This part of the Omineca Division embraces practically all the watershed which eventually drains into the Peace river. Little placer-mining has been done in it during recent years, although in both 1913 and 1914 evidences of reviving interest were shown in the work of the Royal Standard Company on Germanson creek, and of the Kildare Mines, Limited, on Slate creek. Concerning the latter, the manager says, in the course of a generally favourable report: "The pay-streak appears to be exceedingly rich, and the portion passed through the sluice-boxes last season gave a yield of about $30 to the cubic yard. The outlook for next season is excellent. Having found the pay-streak and followed it for more than 100 feet, there is now something definite to go upon. . . . All the gold recovered was coarse, with pieces varying in weight from a few grains to ⅞ oz. One nugget found weighed 1.75 oz.; this was sent to the company's office in Ottawa."

Hazelton-Telkwa Region.—In the vicinity of Hazelton and Telkwa lode-mining was prosecuted with considerable vigour in the early part of the year, but the outbreak of war in August caused a shut-down of all the properties. Notwithstanding this, the amount of ore shipped and development-work carried out were greater than during 1913. At several properties, which were worked in a small

way either by the owners or leasers, ore was sacked prior to August 1st, but was never shipped owing to the inability of the owners to get what was considered satisfactory terms from the smelters.

The *Silver Standard*, on Glen mountain, shipped 720 tons of high-grade silver-lead ore, and the *Black Prince* was worked under lease, a quantity of ore being sacked ready for shipment.

On Nine-mile mountain leasers were at work on the *Silver Cup*, *Sunrise*, *Silver Bell*, and *Silver Pick*, but although ore was sacked up by some of them, it is not believed any of it was shipped. The *American Boy* mine was developed during the early part of the year and 45 tons of ore shipped.

On Rocher Déboulé mountain there was considerable activity. The *Wonder* and *Black Prince* groups, at the head of Mud creek, which are under bond to Spokane interests, were developed for a time. The *Great Ohio* group, in Juniper basin, was developed by means of a long adit tunnel, and it is stated some bodies of copper ore were uncovered.

On the Rocher Déboulé Copper Company's property the leasing company drove a long crosscut tunnel, and also made a large expenditure on surface improvements. These latter included: A 200-horse-power hydro-electric power plant on Juniper creek and transmission-line four miles and a half in length to the mine; an electrically driven air-compressor giving 744 cubic feet of air a minute at 90 lb. pressure at the mine; a sawmill, offices, cook-house, bunk-houses, etc.; a Leyner drill-sharpener and other necessary machinery. The construction was nearly finished of a tramway system to transport the ore from the mine to Carnaby, on the Grand Trunk Pacific Railway. This consists of a level surface tram to the upper terminal of an aerial tramway, and this latter tramway is four miles long and built in two independently operated sections. An auxiliary tramway 1,800 feet long, for men and supplies, was constructed from the mine to the camp. Work was carried on for some time after the war broke out, but has now been suspended. It is understood that the crosscut tunnel struck the vein, and that the values are as good as in the upper workings.

In Hunter basin the *Colorado* was worked under lease and shipped about 60 tons of ore, and from the *King* group 40 tons of copper-silver ore was packed out to Telkwa, but not shipped to the smelter.

On Hudson Bay mountain work was carried out on the *Victory*, *Empire*, *Coronado*, and other properties.

CASSIAR DISTRICT.

The extensive area known as Cassiar District includes the following mining divisions: Atlin, Liard, Stikine, Skeena, Queen Charlotte, and Portland Canal.

Atlin Mining Division.

During the spring of 1914 the town of Atlin was visited by a disastrous fire which destroyed the principal portion of the business section. Late in the summer most of the buildings burned down had been replaced by new ones, more substantially built, and usually of larger dimensions than those destroyed.

The Atlin District during 1914 maintained the rank which it has enjoyed for some years past as the chief producer of placer gold in the Province, and is estimated to have produced $322,000 worth of gold, which represents about 61 per cent. of the Provincial output.

Pine Creek.—The Pine Creek Power Company—a company organized and operated for some years past by J. M. Ruffner—was practically the only active operator on this creek during the past season; the mining was chiefly confined to hydraulicking on the ground known as the *Guggenheim* claims on Tar flats, which the Pine Creek Power Company has been working for some years back on a lease from the owners. J. M. Ruffner, who was the organizer of the company and manager since its incorporation, retired during the season, and was succeeded by Frank Broene, formerly book-keeper and assistant to his predecessor.

Spruce Creek.—On lower Spruce the *Denny* ground was worked by A. D. Hughes by drift-mining. On the *Gladstone* lease, adjoining the *Denny* on the east, James McCloskey continued to operate by drift-mining.

On the upper portion of Spruce creek, below Blue canyon, Swanson and Pettit have been working on a lease by hydraulic mining with a small plant.

Above Blue canyon a pioneer named Meyers has been working on the bench on the right limit of the creek.

J. M. Ruffner and Al. Sweet were engaged during the past season prospecting some deep ground above and adjoining Meyers's lease, and they were also making arrangements to construct a flume and pipe line from South Spruce creek with a view to commencing hydraulic mining on a large scale.

Above Ruffner and Sweet's leases the Fuller Bros. were also prospecting some deep ground.

A new strike was reported on the summit near the sources of Spruce and Slate creeks, but no considerable amount of work was done.

Boulder Creek.—The McKenzie and Black Syndicate was mining on this creek during 1914 on a more extensive scale than in the past, having acquired additional ground by purchase, which has enabled the management to reorganize the system of mining and secure greater efficiency in working.. Individual mining on Boulder creek is being abandoned as fast as the shallow ground is worked over, and the pioneer with his sluice-box or rocker has been displaced by organized hydraulic mining on a large scale.

Ruby Creek.—The Placer Gold Mines Company is reported to have operated with greater success during the past season than during any previous year, having been able to clean up some of the rich ground that development exposed in 1913, and also to install improvements to the plant, the direct results from which were highly satisfactory.

McKee Creek.—The Delta Gold Mining Company, successors to the Pittsburg-British Gold Company, closed its first season's operations in a highly satisfactory manner, not only because their production was of a greater value than produced by the old company, but the costs were reduced and profits thereby increased. The claims, known as the *Christopher* ground, adjoining the holdings of the Delta Gold Mining Company, were acquired by purchase during the season of 1914, which enabled the company to more thoroughly systematize the work on a larger scale than heretofore, and assured ample dumpage for future operations.

Birch, Otter, and Wright Creeks.—Placer-mining was carried on along these creeks during 1914 with satisfactory results as reported by the miners.

O'Donnell River.—The system, inaugurated in 1913 by J. M. Ruffner, of prospecting the river-channel and afterwards opening diversion canals to drain the exposed gravel-bars that had been found to prospect satisfactorily after tests with Empire drills had been made, has been followed in portions of the *Gold Hill* leases, which were acquired during the winter of 1913-14 by the O'Donnell Placer Mining Company, Limited, a company organized by J. M. Ruffner in Cincinnati, Ohio. In addition to this extensive prospecting-work, the company washed the gravel excavated from drifts in the high bench on the right limit of the river; the production from these dumps was reported as satisfactory. The drift-mining was done during the winter of 1913-14, and four pay-streaks exposed within 700 feet from the edge of the high river-bank. A force of about fifty miners was employed by this company during most of the season of 1914, and preparations fully made, by the construction of flumes and ditches, to bring water from Canyon and Berry creeks on to the *Gold Hill* leases for hydraulic mining on a large scale during 1915.

The O'Donnell Partnership has been continuously at work extending the drifts along the pay-streak exposed late in 1913, which is apparently a southern extension of one of the pay-streaks exposed on the adjoining *Gold Hill* lease. The gold secured by these operators is quite coarse; the largest nugget so far found is valued at $25, and the clean-ups show very little black sand.

Several individual miners have been working on bench leases, and some have already exposed pay-streaks as a result of driving into the bench on the right limit of the river, which is usually about 50 feet higher elevation than the bed of the channel.

Mineral Claims.

The only production from quartz-mining in the Atlin Division during 1914 is that reported from the *Engineer* mine, on Taku arm, where, with a 2-stamp mill, high-grade ore has been treated, and some $20,000 recovered by amalgamation from an antimonial arsenide ore in quartz-calcite gangue assaying in some instances as high as $6,800 a ton. The work in the mine has been chiefly confined to developing to reach lower levels, and extending the main adit No. E, which has reached a length of 250 feet, following along the vein the entire distance, and has about 75 feet of backs for most of the length of the adit. A winze has been sunk about 40 feet below the floor of the adit in which the vein is exposed, maintaining perfect continuity, with 12 inches of the width of the vein-filler composed of high-grade ore.

In the Rainy Hollow section of Atlin District a certain amount of assessment-work has been carried on, but no productive mining.

Stikine and Liard Mining Divisions.

In the Stikine Division proper there is no mining going on, and as far as is known very little prospecting; all that has been heard of is a little on the Iskut river by the Iskut Mining Company. There is no placer-mining in this Division.

The south-eastern portion of the Division includes a large part of the Groundhog coalfield, which was described in the 1912 Report, and in which, during this past season, work has been confined to prospecting, with no serious development, and nothing further has been learned that would indicate the future of the camp.

In the Liard Division the only work going on is a certain amount of placer-mining in the vicinity of Dease lake.

The only important workings there are those of the Boulder Creek Mining Company, operating a hydraulic plant on Thibert creek, fully described in the 1912 Report.

This company has been at work all season, working in the new pit, which is reported as proving very satisfactory and producing a fair amount of gold, the exact amount not yet being known, but is said to be over $20,000.

The flats at the mouth of Dease creek, described in the Report mentioned, have this year been the scene of extensive drilling operations by two companies, for the purpose of testing the gold-tenure of the gravels, which, if these preliminary operations prove satisfactory, will lead to the establishment of a dredging plant, to which mode of working the ground is eminently suited.

Queen Charlotte Division.

As yet no returns have been received showing the production of the Queen Charlotte islands, but it is not expected that any great amount of ore has been shipped, with the exception of about 1,000 tons of copper ore shipped during the first part of the year by R. R. Hedley and associates from Tasu harbour to the Tacoma smelter; the copper contents of these shipments did not prove as high as had been anticipated, and the work was eventually stopped.

Ikeda mines shipped 40 tons copper ore to the Granby Company, and it is reported will ship this amount monthly.

Development-work was carried on at Ikeda bay, near Lockeport, and at other points on Moresby island.

On Graham island boring for coal was carried on at several points; some development-work was done, but no commercial mining was done.

Professor Milnor Roberts, of Washington University, with a party, was engaged most of the season making a detailed geological survey of and a report on th

coalfield at Camps Robertson and Wilson for the Imperial Trust Company of New York, who at present are in possession of these areas; the results of this examination have not been made public.

Drilling for oil has been going on at a point on the north-west coast of the island; one of these holes was being reamed out to insert a larger casing pipe and admit of the hole being sunk deeper.

No commercial results have as yet been obtained here or elsewhere on the island.

J. D. Mackenzie and party, of Canadian Geological Survey, spent the greater part of the summer making a geological survey of the island.

Portland Canal Mining Division.

So far as can be learned, there has been no ore shipped from this Division this past year.

In the Bear River section of the Division the only mining operations of importance was the completion of the Portland Canal Tunnels Company's long crosscut tunnel, which has been driven through the crushed zone that had been encountered in the workings of the *Portland Canal* mine, the *Stewart* properties, etc.

At the tunnel-level, veins very similar and possibly identical with those seen at 2,000 feet higher elevation were found, and these carried mineral values, also similar to those encountered on the surface.

Drifts from the tunnel, along the various veins crosscut, are being driven with such measure of success as to give reasonable expectation that ore in commercial quantity and quality will be developed, in which case the future of the several companies interested would be assured.

There has been no work done on the *Red Cliff*. Some work has been done on the Solomon River claims to further develop them, but it is thought no ore was shipped.

The Canadian Exploration Company had a bond on the *Indian* group in this section and had an engineer and party working on the property during the season, with what results is not as yet known.

Skeena Mining Division.

By far the most important mining operations being carried on in this Division—and indeed upon the Coast—are those of the Granby Consolidated Mining, Smelting and Power Company at Anyox, on Observatory inlet. This mine was described in last year's Report, as was also the smelting plant as far as then completed.

The tonnage of "ore in sight" as proven by drill-holes and drifts is estimated at 9,500,000 tons of ore carrying 2.2 per cent. copper and almost 30 cents a ton in gold and silver, and including a body of lower-grade ore, a total of 18,000,000 tons of 1.4 per cent. copper ore.

The opening-up and equipment of the mine is all that could be wished for and thoroughly up to date. It is estimated that mining cost of ore delivered at the smelter will be less than a dollar a ton.

The smelting plant was "blown in" in March, 1914, and has a capacity of at least 2,000 tons of ore a day.

The plant consists of three blast-furnaces, each 50 x 360 inches at tuyere-line, with a connecting plant consisting of three converter-stands, the converters being of the Great Falls type, 12 feet in diameter.

The plant is thoroughly equipped with all adjuncts for the efficient and economical handling of materials, and shops for keeping everything in repair. The power required is derived from a hydro-electric plant situated on Granby bay, the water being taken from Falls creek. The cost of the installation has been about $4,000,000; details of the plant will be given in the 1914 Report.

The company has mined and smelted from March 15th to December 31st, 1914, some 260,000 tons of ore, carrying about 12,000,000 lb. of copper, 2,800 oz. of gold, and 130,000 oz. of silver.

While this is the only property actually producing on Observatory inlet, active development has been in progress at several other properties on Alice arm and elsewhere with such success as to justify the expectation that the Granby Company's mine is only the first of several such in the district.

Active development of mineral properties has been carried on on several islands in the Prince Rupert section, but, as yet, it is too early to predict what results may be obtained.

The Skeena Mining Division extends up the Skeena river not quite as far as the mouth of the Zymoetz, not quite far enough to include a number of properties on either side of the river, which have been seriously developed this past season with some success; these properties are for the most part in the Omineca Division.

No information has been received of any work having been done on the Kwinitsa salt-deposits.

Princess Royal Island.

The most noteworthy advance made in connection with mining along the coast between the Coast District proper and that in which the Granby Consolidated Company is operating—the Skeena District—was that in the neighbourhood of Surf inlet, Princess Royal island, where for four years a Vancouver company, the Surf Inlet Gold Mines, Limited, developed the *D.L.S.* group. In 1914 the Tonopah-Belmont Development Company, of Tonopah, Nevada, continued the development of the property under an option of purchase. The terms of this option include a stipulation that the prospective buyers should, before July, 1915, expend $150,000 on the property. A small power plant was put in early last summer, and the work of driving a crosscut adit 2,000 feet at a depth of 400 feet below the lowest adit of the Surf Inlet Company was commenced. It is stated that about 1,000 feet had been driven by the close of the year; also that rails, air-piping, and all requisite supplies sufficient for 5,000 feet of underground work were sent to the property before the winter came on. Should the exploratory operations now being carried on prove satisfactory, a mill is to be put in and ore production on a large scale is to follow.

EAST KOOTENAY DISTRICT.

South-East Kootenay.

Fully half a century has elapsed since the production of mineral was commenced in East Kootenay District. For thirty years only placer gold was mined; in 1895 a beginning was made in productive lode-mining in the district by the shipment of 50 tons of silver-lead ore from the *North Star*, located in 1892, and which afterward increased its total output to about 80,000 tons. It was in 1895 that mining was commenced at the *Sullivan* and *St. Eugene* lead-mines, also in the Fort Steele Mining Division, and which have since been large producers, the former with a total to the end of 1914 of 231,000 tons of ore having a gross value of $5,500,000, and the latter of 1,018,000 tons valued at $10,672,000. In 1898 the production of coal and coke was commenced at the Crow's Nest Pass Coal Company's Coal Creek Colliery, in South-East Kootenay. Prospecting for oil has been done in the district south from the Crowsnest coalfield, but as yet no commercial production of oil has resulted.

Metalliferous Mining.

While placer-mining continues to be done on several streams in Fort Steele Division, the yield of gold has been small in recent years—only from $2,000 to $3,000 a year. Lode-mining, however, has resulted in a production of lead-silver ore having a gross value of approximately $1,000,000 a year, chiefly from the *Sullivan Group* mine. No mining of importance was done in 1914 at the *Aurora* and *Society Girl* mines, near Moyie, nor anywhere else in the Fort Steele Division except that noted below.

Sullivan Group.—A production of about 35,500 tons of ore containing 24,188,000 lb. of lead and 474,500 oz. of silver was made from this mine in 1914, while more than 3,000 feet of development-work was done underground, and about 5,000 feet of

diamond-drilling. The comment of the general manager of the Consolidated Mining and Smelting Company on this property in his last annual report was as follows: "At Kimberley development of the *Sullivan* group has demonstrated a very large amount of complex lead-zinc ore, of which a considerable proportion can be shipped under present conditions and smelted for lead, while there remains a very large tonnage, which is comparatively high in zinc, but is, as yet, not available for shipment, although its gross value is upward of $20 a ton."

St. Eugene.—Operations in this mine have latterly been on a comparatively small scale. There was an intermittent production of ore up till the beginning of September, but the output was only about 900 tons for the year, this having contained approximately 700,000 lb. of lead and 18,000 oz. of silver.

Coal-mining.

Three coal companies operated in the Crowsnest region in 1914—namely, the Crow's Nest Pass Coal Company, the Hosmer Mines, Limited, and the Corbin Coal and Coke Company. The total gross output of coal from four collieries (the Crow's Nest Pass Coal Company operated mines at both Coal Creek and Michel) was about 972,000 long tons, which, after deduction of 351,000 tons made into coke, left a net production of 621,000 tons of coal.

Crow's Nest Pass Coal Company.—The considerable decrease in production of coal and coke at this company's collieries, as compared with 1913, is attributed to a general decrease in consumption all over the region in which are its available markets, especially since the outbreak of war in August. This unfavourable experience, however, did not deter the company from making provision for increasing its output, which was done to the extent of adding to the total producing capacity of the company's mines by at least 1,000 tons of coal a day.

At Coal Creek Colliery a new Wilson fan, capacity 150,000 cubic feet of air a minute, was installed at No. 1 East mine, and an endless-rope haulage-tunnel was prepared for putting in a double-track system, beside which a third inlet and drainage-tunnel was driven. At the new B mine a fan was installed and the mine was opened to a producing capacity of about 800 tons of coal a day. At the old No. 2 mine formerly very productive, development-work was done which is expected to allow of recovery of a breadth of workings at least equal to the highest and best past output of this mine.

At the Michel Colliery the new No. 8 mine was developed to a capacity of 600 tons of coal a day; No. 3 seam, on the south side of the valley, was redeveloped and coal of a greatly improved structure was opened; and two new seams of coal were found on the south side, approximately 175 and 250 feet respectively above No. 3 seam, and these were traced to points suitable for development whenever deemed expedient.

Hosmer Mines, Limited.—This company last summer closed its mines near Hosmer and, it is understood, permanently abandoned mining there, having found the country in that immediate neighbourhood to be so disturbed and broken as to make profitable mining of the coal occurring there quite impracticable. The company while working in 1914 made a gross output of 118,000 tons, using 53,000 tons for making coke, of which 35,000 tons was produced, while 65,000 tons of coal was sold as such.

Corbin Coal and Coke Company.—Production at the Corbin mines was a little higher in quantity in 1914 than in 1913. More surface stripping was done at No. 3 mine, a big open pit, also known as the "Big Showing," from which was obtained most of the coal shipped in the year under review. A Marcus horizontal screen and conveyor was added to the coal-cleaning appliances of this colliery. The gross output in 1914 is estimated at about 75,000 tons.

Coke-making.

Of the total production of 237,931 long tons of coke, 202,693 tons was made at the Crow's Nest Pass Coal Company's ovens, nearly, if not quite, all at Fernie, and

the remaining 35,238 tons at Hosmer. It was reported that the Crow's Nest Pass Coal Company had arranged to lease the Hosmer Company's ovens, but the war coming on so interfered with the demand for coke that none was made at Hosmer in the latter half of the year. An improvement in the demand at the end of 1914 led to coke again being made at Michel as well as at Fernie.

North-East Kootenay.

This includes the Golden and Windermere Mining Divisions. The only operating mine in this district in 1913 was the *Monarch*, at Field, in the Golden Mining Division; this property closed down about the end of 1913. No production was made in the district.

As has been frequently noted in former reports, there are a number of properties in the Windermere that have a considerable tonnage of silver-lead ore developed, which it is claimed has been held back for years awaiting the arrival of railway transportation.

The long-expected railway from Fort Steele to Golden has at last been completed, and in January, 1915, regular passenger-train service was inaugurated, so that now there seems to be no reason why ore shipments from this district should not be made as soon as the metal market again becomes normal.

WEST KOOTENAY DISTRICT.

West Kootenay District has long been one of the most important in the Province as a metalliferous-mining region, though in some years Boundary District has produced metals of a larger total value as well as a much greater quantity of ore. The metals produced in West Kootenay are gold, silver, lead, copper, and zinc, which comprise all the lode metals of commercial value yet obtained in the Province. Rossland, in Trail Creek Mining Division, has been its most productive mining camp. Next in importance come Slocan, Ainsworth, and Nelson Divisions, with Trout Lake Division one of the small producers. There are other divisions, but no mining of importance has been done in them in recent years.

Ainsworth Mining Division.

The biggest shippers from Ainsworth Division in 1914 were the *Bluebell*, *No. 1*, and *Highland* mines, each with a comparatively large output. Next in importance, as regards quantity of ore shipped, were the *Maestro*, *Utica*, and Retallack & Co.'s *Whitewater* group. Eight or ten others shipped ore during the year, but in each case less than 100 tons.

Bluebell.—The New Canadian Metal Company operated the *Bluebell* mine and concentrating-mill until August, when the metal-market conditions necessitated a suspension of production. During the seven months the mine was worked about 50,000 tons of ore was mined and concentrated, and the product, nearly 4,400 tons of lead-silver concentrate, shipped to Trail. Development-work done in 1914 consisted chiefly of sinking to and opening the C level, which is 200 feet below the level of Kootenay lake. Mining was done on all three levels, A, B, and C, and ore stoped on each of them.

Consolidated Company's Mines.—The Consolidated Mining and Smelting Company operated the *Highland* mine and concentrating-mill, and the *No. 1*, *Banker*, and *Maestro* mines, all near the town of Ainsworth. Ore shipments to Trail were: *Highland*, 2,800 tons (ore and concentrate); *No. 1*, 4,885 tons; and *Maestro-Banker*, 732 tons. Development-work done, chiefly in drifts, crosscuts, and raises, was as follows: *Highland*, about 3,000 feet; *No. 1*, 1,273 feet; and *Maestro-Banker*, 746 feet. The general manager states that the new hydraulic-power system installed for the *Highland* and *No. 1* will save its cost in one year's operation. Additions to equipment were mainly air-drills and hoists and to the *Highland* sampling-mill.

Other Mines.—The *Early Bird* shipped two cars of ore; the *Silver Hoard* completed making additions to its power plant, installed electric light and power systems, did more development-work, and prepared plans for a 50-ton mill; the Florence

Silver Mining Company continued development and opened an ore-body stated to be 650 feet in length and containing silver, lead, and zinc; the *Cork-Province* property, on the South fork of Kaslo creek, was acquired by local men; the *Cork* mine was reopened and the mill overhauled; more development was done at the *Utica* and both lead and zinc ore was shipped; J. L. Retallack & Co. did more development in the *Whitewater Group* mines and shipped zinc as well as lead ore; the *Panama* sent down 65 tons of silver ore; and several other properties about Whitewater also were small shippers.

General.—The reconstruction of the Kaslo & Slocan Railway was completed, thus giving through railway connection between Kaslo, on Kootenay lake; Roseberry, near the head of Slocan lake; and Nakusp, on Upper Arrow lake (Columbia river). This provision of railway transportation facilities should lead to more mining being done in the district through which the railway passes.

In the northern part of the Division the marble-quarry at Marblehead was worked, and on Lardeau river efforts were again made to dredge for gold.

Slocan and Slocan City Divisions.

The extent to which the European war affected production of silver-lead ore in the Slocan is shown by the considerable decrease in the quantity of ore and concentrates received at the Trail smelter from Slocan mines during the latter part of August and the remaining months to the close of 1914. For thirty-three weeks ended August 20th the total of receipts from these mines was 13,178 tons, an average of 399 tons a week; for the remaining nineteen weeks of the year it was 1,679 tons, an average of only 88 tons a week. This does not take into account the zinc product made during the respective periods mentioned. It will be seen that receipts at Trail of Slocan ore and concentrates in 1914 totalled 14,857 tons. Of this quantity, 9,129 tons, or 61 per cent., was selected ore and concentrates from the *Standard* mine and mill, near Silverton. Next in order of quantity received was the *Rambler-Cariboo* mine and mill, with 1,934 tons, also of first-class ore and mill concentrates, and then followed the *Slocan Star*, Sandon, with 868 tons; the *Van-Roi*, near Silverton, 615 tons; and the *Surprise*, near Cody, with about 500 tons of crude ore. Notes on individual properties follow:—

Rambler-Cariboo.—Beside the crude silver-lead ore and the concentrates shipped to Trail, as stated above, there was sent out to smelting works in the United States about 970 tons of silver-zinc concentrates. The development done in the mine during the year included the extension of the 900-foot level by 300 feet, of the 1,200-foot level by 400 feet, of the 1,300-foot level by 200 feet, and some 200 feet of raising between levels.

Slocan Star.—A feature of the year was the satisfactory results of development-work done on the tenth or lowest level of this mine, where good ore was found. The total footage of development-work done was 2,403 feet, this including work on levels Nos. 6, 7, 8, and 10. A large proportion of both the higher-grade ore shipped crude and the milling-ore was obtained in stopes from No. 8 level, in the east drift of which there was still a fine face of ore at the end of the year. The concentrating-mill on this property was put in operation about the middle of June after having been unused for nine years. Suspension of mining in August as a result of the war necessitated closing the mill, which during the seven weeks it had been running produced 276 tons of lead concentrates and 664 tons of zinc concentrates. The year's improvements consisted of repairing and remodelling the mill, 2,000 feet of new wood pipe in the water-line, repair of tram-line and new ore-pocket at its upper terminal, etc., the whole having cost about $8,000. It is claimed that there is enough ore in sight to keep the mill supplied for a year and a half.

Surprise.—The 500 tons of ore shipped to Trail was only a small proportion of that either mined or opened ready for mining, much of the latter containing too high a percentage of zinc for shipment to Trail as crude ore. Late in the year a commencement was made to haul ore to the *Ivanhoe* concentrator, at Sandon, a contract having been entered into to supply 1,000 tons of ore a month for milling. Sufficient

ore is in sight for the requirements of several months under this contract. Last summer the aerial tramway from the mine down to Cody creek was improved by putting in 13,000 feet of new wire traction-rope.

Other Mines about Sandon.—At the *Payne* driving the crosscut adit between 2,000 and 3,000 feet was completed, and raising to the old productive workings above was commenced. At the *Ruth-Hope* the lowest level, No. 5, was extended about 800 feet, with 600 feet more to be driven to get under the ore-shoots occurring in the old workings above. The *Richmond-Eureka* shipped 380 tons of ore, but nothing important resulted from continued exploration underground. Only development-work was done at the *Noble Five* group, on which a long crosscut adit is being driven to intersect five known veins; a compressor was installed to provide power for machine-drills. The discovery of a new shoot of ore on the *Reco* was reported. A quantity of silver ore was packed down from the *Mountain Con* to Sandon, for shipment when prices should be better. Small lots of ore were sent out from the *Antoine*, *Colonial*, *Freddy Lee*, *Ivanhoe*, and *Lone Bachelor*. More development was done on the *Wonderful* and 100 tons of ore shipped to Trail. Ore was sacked at the *Idaho-Alamo* for shipment later. Several other properties had more or less work done on them. Altogether, activity was general up to the latter part of summer.

Silverton camp was by far the most important in the district from the point of view of production, and had it not been for adverse conditions brought about as a result of the war it would have made an even better showing. Several small properties within a few miles of New Denver were worked—namely, the *Apex*, *Hartney*, *California*, *Echo*, and others, and the *Lucky Thought*, on Four-mile creek. The larger mines in Silverton camp are the *Standard*, *Hewitt-Lorna Doone* group of the Silverton Mines, Limited, and the *Van-Roi*.

Standard.—As already mentioned, more than 9,000 tons of silver-lead ore and concentrates was received at Trail from the Standard Silver-Lead Mining Company's mine and concentrating-mill. The production of zinc concentrates, which was shipped to the United States, was continued until late in the year, when milling was stopped until prices of metals should be higher. The approximate quantities of metals produced in 1914 were: Silver, 890,000 oz.; lead, 12,000,000 lb.; and zinc, 4,000,000 lb. Work done in the mine included the following: No. 3 adit was extended in the expectation that an ore-shoot opened from No. 4 level at about 100 feet deeper would be found at the higher level, but only pockets of ore, up to 19 feet in length, were met with. On No. 4 the ore-shoot was mined along a distance of 235 feet, but latterly it was of a zincy nature. In one part the ore-body was fully 40 feet in width, of mixed shipping and milling ore, with some barren ledge-matter as well. Between levels Nos. 5 and 6, which are 125 feet apart, there are big shoots of ore still to be mined; several raises have been made to connect those levels, some of them in ore throughout. Stoping was in progress from No. 6 level until ore production was curtailed in August. No. 7 adit was advanced to a distance of 4,400 feet, when bunches of zincky ore were encountered. Since the close of 1914 a raise from this level was reported to have entered good silver-lead ore at 12 feet up from the level. During the year two shoots of ore were passed through, but these were not exploited, for the reason that it was regarded as more important to continue exploration ahead and determine, if practicable, whether the big ore-bodies opened on No. 6 continue downward to No. 7. A still lower adit, No. 8, was driven, and by the end of the year was well on to 1,500 feet in from the portal; it had encountered zincky ore, but it was expected that from 3,000 to 4,000 feet more would have to be driven before reaching the zone in which occur the big shoots of silver-lead ore that were so productive in and above No. 6 level. Ore-bins were built near the portal of No. 7 adit, and a tramway loader procured, but connection has not yet been made with the tramway from No. 6 to the mill.

An experimental unit of the Minerals Separation flotation plant, with the requisite tanks, etc., was added to the concentrating-mill equipment, but its use did not result in any decision being come to as to the permanent adoption of this process here. The company in 1914 distributed $175,000 in dividends among its shareholders, but after September the earnings above cost of operating mine and

mill on a small scale and continuing development did not leave a sufficient margin of surplus to allow of dividends being paid for the last three months of the year.

Hewitt and Van-Roi.—At the *Hewitt* over 18,000 tons of ore was mined, the silver-lead concentrates going to Trail and the zinc concentrates to the United States. *Van-Roi* mined about 11,000 tons of ore; the silver-lead product going to Trail and the zinc concentrates to the States. No particulars of the year's operations were received from either mine, but it is known that work was suspended on the *Van-Roi* in the autumn, and that the *Hewitt-Lorna Doone* mine was still at work, though on a reduced scale, when the year closed. There has been opened in the latter mine a large quantity of ore ready for extraction, so that when conditions shall be favourable a comparatively large output may be made.

Slocan City Division.

Little of importance occurred in connection with mining in this Division during the year, save, perhaps, that some progress was made on the *Ottawa* by the Consolidated Mining and Smelting Company, which purchased this property in 1913; high-grade ore was found in the course of development-work, but the several shoots were comparatively small. Shipments of ore from mines in the Division were: *Ottawa*, 279 tons; *Eastmont*, 149 tons; *Enterprise*, 57 tons; *Black Prince*, 10 tons; and *Neepawa*, 4 tons. Late in the year it was reported that some men had gone to work on the *Meteor*.

Nelson Mining Division.

The effects of the war on mining were distinctly noticeable in Nelson Division during the latter part of 1914. Some of the direct results were the discontinuance, temporarily, of mining and ore production at the mines that had been operated previously by the Consolidated Mining and Smelting Company—namely, the *Silver King* and *Molly Gibson*. Probably other causes led to a suspension of work at the *Queen Victoria* and *Eureka*, both operated for some time by the British Columbia Copper Company. While ore production was to some extent lessened in the neighbourhood of Salmo, in the southern part of the Division, the several lead-producing mines affected resumed shipment of ore in the autumn. The larger gold-mines of Sheep Creek camp maintained their output, and four or five others in various parts of the Division also contributed to the total gold yield for the year.

In the eastern part of the Division, while considerable prospecting and development has been carried on, there has been, as yet, no productive mining.

In the Summary Report of the Geological Survey, S. J. Schofield publishes a report which includes this district, and from which the following notes are taken:—

The claims of the La France Creek Mining Company, a Chicago organization, are situated at the head of La France creek, nine miles east of Kootenay lake, at an elevation of 7,800 feet. The ore consists of argentiferous galena and zinc-blende with some chalcopyrite. The veins occur in a very siliceous limestone, and are two in number, dipping at angles of about 80 degrees.

The deposit is opened by three tunnels; the upper one is 130 feet long, with a winze 67 feet deep. The intermediate tunnel, at 130 feet lower elevation, is in 332 feet, with two crosscuts. The lower tunnel, 240 feet lower than the intermediate, is in 652 feet. Prospecting is being done at present to open stoping ground.

Molly Gibson.—Only brief comment on this property was made in the annual report of the Consolidated Mining and Smelting Company for the fiscal year ended September 30th, 1914, as follows: "The *Molly Gibson* was operated for a short time, but was closed at the commencement of the war, little development having been done; but such as has been done has shown the vein in the bottom level to be as promising as in the levels above." As in an earlier report the general manager of the company stated that this level "had developed considerable new ore, much of it of very good grade, and the mine looks better than ever before," it may be taken for granted that the opinion of the manager that the mine "should in time be a

producer of considerable profit" is likely to be borne out. The 500 tons of ore and concentrates shipped from Trail in 1914 contained approximately 24,500 oz. of silver and 111,000 lb. of lead.

Silver King.—There was a gradual increase in output of ore from this mine until suspension of production was necessitated by the unfavourable conditions for sale of metals. In July shipments averaged rather more than 600 tons a week. The total output for the seven months prior to August was 11,421 tons, containing 234 oz. of gold, 107,187 oz. of silver, and 487,238 lb. of copper. Development-work done consisted of 745 feet of drifting and crosscutting and 332 feet of raising.

Other Mines around Nelson.—The *Queen Victoria* shipped to Greenwood 7,980 tons of ore, which yielded 201,000 lb. of copper and nearly 2,900 oz. of silver. Work was resumed in the *Granite-Poorman* gold-mines late in the year by a Nelson man, who is working the property under lease. The British Columbia Copper Company did not continue development-work under its bond on the *Eureka*. Some development-work was done on the *Pingree* with, it is reported, promising results. The *Venus* and *California* gold-mines were worked; the former milled nearly 1,000 tons of ore and recovered 470 oz. of gold, and the latter sent to Trail 45 tons of ore averaging a little more than 2 oz. gold to the ton.

Mines near Ymir.—The *Porto Rico* was worked for a while and 120 tons of gold ore was mined. The *Yankee Girl* in the early part of the year shipped 227 tons of ore averaging nearly 1½ oz. of gold to the ton, but after that only development-work was done, opening the mine to a greater depth. The *Dundee* was idle most of the year. At the *Ymir-Wilcox* gold-mine development was continued on a level 400 feet lower than the old workings, in a body of dry siliceous ore having an average width of 30 inches.

Salmo Mines.—Three or four lead-producing properties within a few miles of the town of Salmo were shippers; shipments from them were, approximately: *Emerald*, 1,100 tons; *H.B.*, 1,000 tons; and *Zincton*, 500 tons. The *H.B.* and *Zincton* also shipped zinc-carbonate ore to the United States. A first car-load shipment was made from the *Leadville*, another property in the same neighbourhood. There was also some molybdenite ore shipped at Salmo; this came from claims near Lost creek [illegible] miles from Salmo.

[illegible] *Creek.*—About 9,800 tons of ore was milled at the *Queen* 20-stamp mill; this [illegible] more than 5,500 oz. of gold. Most of the ore was taken from a large shoot, [illegible]ging in width up to 35 feet and occurring on the 600-foot level. Beside stoping, there was done about 200 feet of drifting in the *Queen*, and 270 feet in the adjoining *Alexandra* claim, one of the *Queen* group, in which the ore, though not in such large quantity, is of higher grade. About 20,000 tons of ore was milled by the Motherlode Sheep Creek Mining Company; the gold value of the *Motherlode* ore was lower than that mined and milled in 1913. Some twenty men were employed on the *Golden Fawn*, in connection with which the *Nugget* small stamp-mill was leased. The *Ore Hill* and *Summit* properties were worked under lease in the latter part of the year, and the *Ore Hill* stamp-mill was repaired and some ore crushed in it.

Erie Camp.—The *Relief* mine and stamp-mill were operated, but no particulars of production have yet been received. It was planned to add to the equipment of the *Relief* mill regrinding machinery and a cyanide plant.

Trail Creek Mining Division.

This Division enjoys the distinction of, this year, showing no decrease, but instead a substantial increase of about $200,000, despite the war and its attendant conditions.

The only important mines in this Division are those at Rossland, which for several successive years have produced more than half of the total lode-gold output of the Province, as well as the silver and copper associated with the gold in the ores of this camp. The gross value of the mineral production of this Division, practically all from Rossland mines, during the period 1894-1914 shows a total of more than $62,000,000. As the average annual total value for five years, 1910-14,

has been approximately $3,161,000, it may be seen that the mines at Rossland are continuing to add substantially to the value of the mineral production of British Columbia. The records of this Bureau show that from a total of about $100,000 in 1804 (the records at that time were not very accurate and vary considerably) there was an increase year after year until, in 1902, the maximum amount for any year was reached with a value of $4,893,305. The preliminary estimate for 1914 shows a total value of about $3,481,000, which is higher than for any other year since 1308, which seems to afford convincing testimony that confidence in the stability of the mining industry of Rossland camp is well warranted.

The information available at the close of the year indicates that in 1914 the output of ore was about 300,000 tons. This output was made by the various mines approximately as follows: *Centre Star* group, 174,000 tons; *Le Roi* group, 97,000 tons; *Josie* group, 27,000 tons; and some small shipments. The *Josie* put some of its ore through the concentrating-mill. The metals recovered were: Gold, 140,000 oz.; silver, 133,500 oz.; copper, 4,000,000 lb.

Centre Star Group.—The ore production of this group of mines has already been given as about 174,000 tons, and which had a metal content of about 92,000 oz. of gold, 61,000 oz. silver, and 1,200,000 lb. copper.

Development-work in the *Centre Star-War Eagle* group in 1914 totalled between 11,000 and 12,000 lineal feet, and more than 10,000 feet of diamond-drilling was done. It is of interest to note that at the end of last September the grand total of underground development-work done in all years was 185,434 feet, or rather more than thirty-five miles. The only addition to the surface works last year was the rebuilding of the *Centre Star* ore-shipping bins.

As to the condition of these mines, the following excerpt from the general manager's last published report, issued in December, indicates that it is regarded as being favourable, for the information given is as follows: "The company's mines at Rossland continue to show an increase in the amount of ore available, the greater part of the increase being due to ore developed in the *Le Roi* mine, where development-work has yielded very satisfactory results.

"The crosscut from the *Centre Star* shaft, mentioned in the last annual report as being driven to connect with veins developed on and above the *War Eagle* fourteenth level, and 300 feet below that level, reached the ore about January 1st, 1914, and although the ore-bodies so far opened on this sixteenth level have not been as large as on the fourteenth level, the prospects are that a large tonnage will be obtained between these levels.

"The *Centre Star* shaft below this level is now being repaired, with a view to driving another crosscut, below this sixteenth level, to tap the vein at 300 feet greater depth.

"The satisfactory results of development in the lower levels of the *War Eagle* strongly indicate the favourable possibilities of still deeper development."

Le Roi Group.—The output of ore from this group—also owned by the Consolidated Mining and Smelting Company—for 1914 was about 97,000 tons, having a metal content of approximately 36,000 oz. of gold, 48,000 oz. of silver, and 2,100,000 lb copper.

While it is not so stated in the general manager's report, already quoted from, it is understood that the considerable improvement in the outlook for the *Le Roi* group lies chiefly in the finding of several large ore-bodies of good commercial value in the lower levels.

The plant which is being used for experimental concentration tests was operated throughout the year; this plant is run in connection with the *Black Bear* surface works, where the main power equipment of the *Le Roi* is situated.

Le Roi No. 2.—The Le Roi No. 2, Limited, operating the *Josie* group, mined nearly 27,000 tons of ore, of which amount 10,300 tons was sent to the mill for concentration, producing 1,170 tons concentrates.

The Le Roi No. 2, Limited, temporarily suspended work following the disorganization of commercial and financial conditions by the outbreak of war, but, in the course of a few weeks, had its affairs so arranged that ore production was

resumed and shipment to Trail maintained for the remainder of the year. Developments on the *Annie* claim of this group early in the year resulted in opening a shoot of ore containing good value in gold and copper across an average width of 6 feet. A winze sunk from the 1,650-foot level before the middle of the year was in ore the whole of the 85 feet then sunk, and neither wall of the vein had been reached. It was stated that there was little doubt of this ore-shoot continuing upward into the adjoining *Black Bear* (*Le Roi* group) ground. Results of underground exploration in the northern part of the Le Roi No. 2 property encouraged the company to continue its work there. An option was taken by the company on the *Giant-California* mines, adjoining the *Josie* group on the west.

South Belt Properties.—Beyond small shipments from the *Blue Bird* and *Phoenix*, there was no production from mines in the South Belt of Rossland camp. Efforts were made recently to have work resumed on both of these properties, with a prospect of success. The Consolidated Company acquired the *Sunset No. 2* group with other assets purchased from the Canadian Goldfields Syndicate, but no development-work had been undertaken on the *Sunset* before the end of the year.

Trail Smelting-works.—Many improvements were made during the year to the Consolidated Mining and Smelting Company's smelting and lead-refining works at Trail. These included important additions to both lead- and copper-smelting equipment, the installation of a Cottrell plant for clearing the blast-furnace gases of lead-fume, additions in the blower-room, and general improvements in all departments of the works. The objects of these alterations and improvements are thus set forth: "First, to increase the capacity of the plant; second, to increase metal recoveries; third, to decrease costs of operation."

The last annual report of the Consolidated Mining and Smelting Company of Canada, Limited, includes the following figures relating to the smelting operations at its works at Trail during the fiscal year ended September 30th, 1914: Ore and concentrates smelted, 374,771 tons. Metals produced: Gold, 129,083 oz.; silver, 2,568,301 oz.; lead, 34,617,318 lb.; copper, 3,645,997 lb. The ore smelted included silver-lead ore and concentrates received from Ainsworth and Slocan mines; lead-silver ore of East Kootenay mines; gold, silver, lead, and copper ores from mines in Nelson Division; gold-copper ores of Rossland mines; sundry ores from various other parts of British Columbia, and about 20,000 tons of gold and copper ores from the neighbouring State of Washington. The total gross value of the metals produced was $6,000,662. Of that comparatively large amount it is estimated that $3,400,000 represented the value of the contents of Rossland ores included in the total. The average of the weekly shipments of ore from Rossland mines to the Trail smelter throughout the year 1914 was 5,565 tons.

Other West Kootenay Divisions.

There was very little productive mining done in any of the other Divisions of West Kootenay during the past year.

In the Trout Lake Division the mineral production in 1914 was smaller than for several years past.

The *Ajax* shipped about 55 tons of high-grade silver-lead ore and the *Silver Cup* about 33 tons of similar ore; these are the only mines of which, as yet, any record of shipment has been received, and it is believed that few, if any, other properties in the Division made shipments this past year.

The old *Silver Cup* mine, in which there would appear to be very little known ore left, has been one of the most interesting in the Province, and has shipped ore steadily since about 1896. The following is an extract from the 1900 Report of this Department, speaking of the *Silver Cup* at that time:—

"The total shipments to date from the property are about 1,100 tons, of which 265 tons have been shipped during the current year. Ore values average about 140 oz. silver and $4 in gold to the ton and 30 per cent. lead."

A great deal of development-work has been carried on at various points in the Division, while attempts have been made at placer-mining near Trout Lake and at

gold-dredging on the Lardeau river, in the southern part of the Division, but with what economic results is not at present known.

In the Lardeau Division, as far as is known at this time, there was no ore shipped, although a small quantity may have been taken out from some of the small but high-grade properties near Camborne.

During the past season this Bureau had both the Lardeau and Trout Lake Divisions examined and reported on, as to their mineral resources, by Newton W. Emmens, M.E., and in December, 1914, issued his reports in the form of a bulletin (No. 2, 1914), with maps and illustrations. As this bulletin has been distributed and can be had upon application to the Department, it is not necessary to go into details here.

In the Revelstoke Mining Division some placer-mining has been carried on on tributaries of the Columbia river to the north of Revelstoke, but no details of the operations have been received.

It is of interest to note that a serious attempt is being made to resurrect the old *Lanark* mine near Illecillewaet, which in 1896 was mentioned in the Report of this Department as having "estimated to be in sight somewhere in the neighbourhood of 100,000 tons of ore, which will concentrate three and one-half tons into one." The concentrates ran about 60 oz. silver to the ton and 70 per cent. lead. The present owners this past year shipped about 65 tons of sorted ore, which had to be brought down to the railway by horses, as the aerial tramway formerly in use had been removed. The owners state they have discovered new ore-shoots of commercial size and value and that the tramway is to be soon rebuilt.

BOUNDARY DISTRICT.

For the first time in fifteen years, since copper production was commenced in the district in 1900, the year's output of copper from Boundary mines was, in 1914, less than one-half of the total production of this metal in the whole of the Province, being this year a little over one-third of the total. This district, however, is still ahead of any other single district, but by grouping the producing mines along the seaboard of the Province a greater production is arrived at. The main copper-producers in this coastal region are the *Britannia* in the Nanaimo Division and the Hidden Creek mines in the Skeena Division, the aggregate output of these two districts exceeding that of the Boundary by nearly 8,000,000 lb. The Boundary, however, easily retains its lead in respect to tonnage, the total for the year being about 1,100,000 tons, as compared with a total for all the rest of the Province of 2,100,000 tons.

The estimated output of the metals for the past year is: Gold, 83,880 oz.; silver, 328,276 oz.; copper, 16,383,620 lb. This shows a decrease from that of last year of, roughly, 18, 17, and 43 per cent. respectively. This decrease is entirely attributable to the shutting-down in August of the mines and smelters of the Granby Company and British Columbia Copper Company as a result of the European war. Gold and silver returns were not affected as much as copper, because these metals are in part recovered from stamp-milling operations which were continued throughout the year.

Granby Consolidated Mining, Smelting and Power Company.—The effect of the war on the output of ore from this company's mines in 1914 is easily seen by comparing the production figures for the past year with those of 1913. In 1913 the output was 1,227,544 tons, from which was recovered 39,714 oz. gold, 259,116 oz. silver, and 21,219,546 lb. copper; the corresponding figures for 1914 are 741,990 tons, 28,992 oz. gold, 192,773 oz. silver, and 12,614,000 lb. copper. The mines and smelter were closed immediately after the outbreak of war and only reopened about the middle of December, so that the output for the year was practically made in the first seven months. In December work was resumed, at first operating only two and afterwards four of the eight blast-furnaces at the company's big reduction-works at Grand Forks.

The following excerpt from the last annual report of the company's general manager, F. M. Sylvester, for the fiscal year ended June 30th, 1914, may be taken

as giving an idea of the position at the close of 1914, since only two months' work was done in the mines during the six months that elapsed between the close of the fiscal year and the end of the calendar year. Mr. Sylvester reported as under:—

"At Phoenix the acquisition of the *Snowshoe* mine, adjoining the *Gold Drop* mine, added 140,000 tons to the total ore of the company's mines there, while the diamond drilling and other development-work have further increased this by 142,694 tons, the total ore to date showing as 15,132,268 tons, from which has been shipped 10,440,887 tons, the balance of the developed ore being 4,691,381 tons.

"The development-work for the year ended June 30th, 1914, at Phoenix has been more extensive than during any previous year, and though the total tonnage increase of ore has not been considerable, a part of this increased tonnage is of higher grade than the average ore remaining in the mine. The operating cost of 80.4 cents per ton of ore shipped, which includes all costs of breaking, handling, timbering, development-work, and general expense, compares very favourably with previous years."

C. M. Campbell, the company's mine superintendent at Phoenix, in his report gave particulars of underground work, the total of which was 13,647 feet, making a total for all years to the end of June last of 121,495 feet. Diamond-drilling for the year amounted to 10,670 feet, bringing the total to date up to 26,812 feet. It is also stated in the company's annual report that the metal recoveries that can be made from ore from the Phoenix mines are, per ton of ore: Copper, 17 lb.; gold, 0.033 oz.; and silver, 0.2 oz.

The general manager reported that there was treated at the company's smelter at Grand Forks (including custom ores) "1,225,745 tons of ore, from which was produced 21,181,000 lb. of copper, 407,506 oz. of silver, and 43,232 oz. of gold, at a cost for smelting and converting of $1.26 a ton, which cost is as low as has ever been obtained at this plant." The report of the company's smelter superintendent, W. A. Williams, included brief information relative to the Grand Forks works, as follows: "The Grand Forks smelter has done very good work from an operating standpoint. There has been a very high average of furnaces in blast, with good tonnages smelted; recovery good. Our slag losses were similar to those of the previous year. The percentage of silica in the slags was higher. Costs were a trifle lower than in any former year. These results have been attained only by the careful attention of our entire crew of men."

The total of dividends paid by the Granby Consolidated Company in 1914 was $440,955.

British Columbia Copper Company.—This company, in August, discontinued mining at its *Mother Lode* and other mines in the district and smelting at its works at Greenwood, and did not resume operations before the year closed. Shipments made from the company's mines in British Columbia were: From *Mother Lode*, 166,867 tons; *Rawhide*, 85,820 tons; and *Queen Victoria* (Nelson), 7,930 tons; total of British Columbia ores, 260,617 tons. From the company's mines in the near-by State of Washington there was received 7,320 tons of ore, of which 1,988 tons was from the *Lone Star* and *Washington* mine and 5,332 tons from the *Napoleon* mine. In addition, there was received between 20,000 and 30,000 tons of custom ores. The metals recovered at the smelter from all ore treated in 1914 were: Gold, 14,442 oz.; silver, 63,501 oz.; and copper, 4,166,190 lb. These figures compare with the production in 1913 as follows: Gold, 26,641 oz.; silver, 137,002 oz.; and copper, 8,296,902 lb. fine. The much larger quantity of gold in 1913 was in considerable part due to the inclusion that year in the ore smelted of 10,000 tons of siliceous gold ore from mines in Republic camp, Washington.

The *Rawhide* mine, near Phoenix, operated during part of the year by the company, is owned by the New Dominion Copper Company, in which incorporation the British Columbia Copper Company holds a controlling interest.

Jewel-Denero Mines, Limited.—This company worked the *Jewel* mine, near Long Lake, eight miles from Greenwood, throughout the year; also its 15-stamp mill situated at the lake-side. More than 10,000 tons of ore was milled; metals recovered were approximately: Gold, 6,500 oz.; silver, 33,000 oz. The gold and silver occur

in the iron, copper, and lead sulphides in the ore, which is stamped in a weak cyanide solution and then put through the tube-mill until 90 per cent. passes a 200 mesh. The mineral is then concentrated and returned to the tube-mill until it ceases to appear as a concentrate. It thus receives a prolonged grinding in the cyanide solution. The slime is then settled, agitated, and the enriched solution is separated by a Moore filtering plant. The gold and silver are then precipitated on zinc shavings. After the "melt" in a crucible the bullion is shipped to the Dominion of Canada Assay Office, Vancouver.

The *Jewel* main shaft was deepened in 1914 from the 300-foot level to a depth of 520 feet on the incline, and levels were opened at 400 and 510 feet depth, as drifts on the vein. There was about 400 feet of drifting done on No. 4 level and 250 feet on No. 5. While the ore on the bottom level contains similar value to that on Nos. 3 and 4, it is not so wide along the limited length so far driven, nor so regular. However, a change for the better is hoped for after the level shall be further developed.

North Fork of Kettle River.

Union.—This property, owned by two prospectors, in 1914 shipped 1,610 tons of ore containing 1,437 oz. of gold and 48,331 oz. of silver. The mine is in Franklin camp, North fork of Kettle river. It is described and illustrated in Bulletin No. 3, 1914, issued by this Bureau, this publication being a report on "The Mineral and other Resources of the North Fork of Kettle River, in the Grand Forks Mining Division," prepared for this Department by Andrew G. Larson and Clarence S. Verrill, mining engineers. The ore is mined in two different places on the property, part of it being quarried from the surface where it outcropped, and part being stoped from a tunnel level about 100 feet below the outcrop. The actual width of the ore being mined is about 20 feet, but this only represents a portion of the ore-body, high transportation costs necessitating that only the higher-grade ore shall be taken out. In the tunnel level the ore is exposed for a width of 40 feet; average samples across that width are said to give an assay return of $26.30 a ton in gold and silver.

The cost of hauling ore in horse-wagons from the mine to the railway at Lynch creek is $13.50 a ton, and thence by rail to the Granby smelter $1.50 a ton. Other charges bring the total cost of freight, treatment, etc., up to approximately $25 a ton.

The bulletin mentioned also gives particulars of numerous other properties and of the mineral resources generally of this part of the Boundary District.

Other Mines.—There are in various parts of the district, in country tributary to Christina lake, North fork of Kettle river, Boundary creek, and the main Kettle river, many mineral claims on which development-work has been done, and in some cases from which ore has been shipped, but in this connection there is little of importance to note as having taken place in 1914.

West Fork of Kettle River.

The railway from Midway to Penticton will afford transportation facilities to the several mining camps along the West fork of Kettle river whenever railway freight-trains shall be operated over this lately completed line. Work was done on a number of mineral claims near Beaverdell and Carmi respectively, and there was some ore-production at the *Sally*, which shipped 482 tons containing about 18,000 oz. of silver, and at the *Carmi*, where a small stamp-mill was operated for a while. Efforts are being continued to work the *Sally* regularly, but a difficulty has been found in the delay in running railway-trains to that part of the district. An increase in mining development and ore production in 1915 is looked for.

Osoyoos Mining Division.

In bygone years there was much mining activity on the Okanagan slope of the mountains that form the divide between Okanagan and Similkameen valleys. Latterly there has been but little mining done in Fairview camp, while that at the *Dividend-Lake View* property, on Kruger mountain, two miles from the International

Boundary-line, has only made slight progress and shipped 135 tons of ore containing 120 oz. gold. Olalla camp, a few miles from Keremeos, is another part of this country of which much was heard some years ago, but now attracts little attention from mining men. Camp Hedley, farther up the Similkameen, has "made good"; that is, one group of mineral claims in it has done so, and that abundantly. That group is the *Nickel Plate-Sunnyside* group, for years operated by the Marcus Daly interests, and latterly by the company recently organized, the Hedley Gold Mining Company. Other groups among them the *Index*, *Golden Zone*, *Kingston*, *Oregon*, *Pollock*, and several more, have had more or less development-work done on them, but, aside from a small production from ore put through the *Golden Zone* stamp-mill some time ago, they have not yet contributed to the mineral production of the Division, which has thus far had only the *Nickel Plate-Sunnyside* mines as important producers of metalliferous minerals. One notable enterprise, however, is that of the New York Syndicate No. 2, which, during the field-work seasons of both 1913 and 1914, has done much diamond-drilling on a group of claims situated near Hedley, which property is being thus explored under option of purchase.

Hedley Gold Mining Company.—Apart from the fact that this company kept its *Nickel Plate-Sunnyside* mines and 40-stamp mill in full operation throughout 1914, the chief feature of interest was the practical completion of the company's new hydro-electric power system, water having been turned into the flume and the power machinery given its initiatory run during the last week or so of December.

Preliminary figures, these including an estimate of the production in November and December, show that in 1914 the value of the gold bullion recovered at the Hedley Company's mill was about $781,443, this being the product of 77,900 tons of ore crushed and treated. These figures compare with a total in 1913 of $802,390 from 70,796 tons milled. The average value recovered in 1913 was $11.33 per ton of ore milled; the preliminary figures given above show a recovery in 1914 of $10.03 per ton. This lower average value was foreshadowed in the report for 1913, for the general superintendent included in his report for that year the following intimation: "We estimate the reserve tonnage of ore that can be mined and milled at a profit to be equal to our last year's estimate of 413,000 tons, but, owing to the new ore-bodies to the north being of lower grade than usual in this mine, and the failure to check the value in the drill-hole to the west of the 600-foot level, we would not estimate the value of the present reserves at more than $10 a ton. We hope, however, to make similar earnings per ton, through cheaper power and possibly a slight increase in tonnage." As the amount of the expenditure for the year is not yet made known, no opinion can be formed as to how far the superintendent's forecast has been realised, except that he did not have the benefit of cheaper power. However, a recovered value of $10.03 a ton from ore reported to be of an estimated average assay value of $10 indicates that the superintendent was commendably conservative when making his estimate.

Similkameen Mining Division.

The Similkameen Mining Division comprises, practically, all the drainage area of the Tulameen river and the Similkameen above Nine-mile creek.

Many years ago placer-mining was carried on in this section on a considerable scale, and even yet a small amount of placer gold and some crude platinum are recovered each year.

Coal-mining has been in progress near Princeton for some years, and about 18,000 tons of coal was here mined in 1914. Beyond this, mining in this Division has not as yet reached the productive stage, although a great deal of extensive development has been going on for some years, with such success that it seems probable that within a couple of years it will be possible to record a substantial mineral output from this Division.

Much development and other exploratory work has been done on numerous mineral claims on Copper mountain, in Voigt, Princess, and Sunset camps, respectively. Placer-mining has been active, both along the main Tulameen river and on

Granite and other tributary creeks, while mineral claims on Treasure mountain, Summit camp, well up the Tulameen toward the eastern slope of the Hope mountains, have been prospected and showings of silver-lead ore opened.

Princess and Sunset Camps.—For the greater part of the last two years the British Columbia Copper Company has been prospecting and exploring a number of claims, eleven or more, situated in these adjoining camps which are on or near the summit of Copper mountain. Much work has been done, the working force having at times consisted of more than one hundred men. A great deal of trenching and open-cut work was done on the surface, while shafts and tunnels were sunk and driven underground. In addition, five or six diamond-drills were used. No details have been given out for publication, but it has been authoritatively stated that the results of the work as a whole were eminently satisfactory. A year ago the company issued its annual report for 1913, and in that mentioned that the tonnage of reasonably assured and probable ore on one group was estimated at 4,000,000 tons, with an average value of 1.87 per cent. copper and gold and silver from 25 to 50 cents a ton, and on another group the estimated quantity by that time outlined was 550,000 tons of ore, averaging 1.35 per cent. copper with 35 cents a ton in gold and silver. If it be taken into account that further satisfactory results were achieved in 1914, there should be little doubt as to the great promise that exists for the eventual establishment in that part of the Province of another important copper-producing centre.

Preliminary surveys have been made for a railway to Copper mountain, to branch off from one of the lines near Princeton, and legislative authority for its construction has been applied for.

Voigt Camp.—Newspaper reports to the effect that the Similkameen Consolidated Copper Company had acquired the *Voigt* copper property, situated on Copper mountain, within a dozen miles of Princeton, do not appear to have been confirmed. The facts are that last July Emil Voigt gave an option on most of the claims in the *Voigt* group to a Pennsylvania syndicate, which made some small payments on account of the agreement to purchase and expended a few thousand dollars on further development-work. About 300 feet of tunnelling was done from points where the British Columbia Copper Company left off developing under its option of purchase a year or so earlier. In three places ore in considerable quantity and of good grade was opened by this new work, and an additional advantage claimed is that the ore contains a large percentage of iron.

Placer mining.—The hydraulic leases known as Coulthard's *Roany* claims on Tulameen river, about four miles below the mouth of Granite creek, are to be worked with Chester F. Lee, of Seattle, Washington, to direct operations. During 1914 more than two miles of flume was constructed from Four-mile and Six-mile creeks, and water was brought in at an elevation of about 300 feet above the old channel; some ground was tested under working conditions, but no run of gravel-washing was made. It is expected that both placer gold and platinum will be recovered here in payable quantities when sufficient water shall be obtainable for hydraulicking.

Lambert & Stewart are reported to have done well last summer on their placer lease near the junction of the North fork with Granite creek. For several years Mr. Lambert, the resident partner, has persisted in his efforts to get down to bed-rock above the canyon, but twice his dam went out when the summer freshets came. Then, when the third dam held, his method of working did not prove effective, quicksand instead of bed-rock being encountered. Finally, last winter, he let a contract for a rock tunnel to be 6 feet high, 4 feet wide, and 320 feet long, to carry the tailing below a rock-slide that kept coming down and filling the creek, and this tunnel enabled the miners to get at the gold-bearing gravel. The quantity of gold recovered has not been ascertained by the writer, who has been informed, though, that one clean-up witnessed gave very coarse gold and much platinum. It is stated that throughout the summer more platinum than gold was recovered; the largest nugget of gold found was worth $10.00, calculated at the rate of $17.75 an ounce. The miners were much bothered

by a deposit of cemented vegetable matter on which the water had very little effect. Mining is to be resumed here as early as possible next spring.

Wheeler's claim, on the old *Pogue* property, was worked by drifting all last winter and summer, and is reported to have been paying. Some pretty gold specimens from there have been shown; one piece, said to have been chipped off the bed-rock, was more than half gold, some of the nuggets in it up to $2 in value. The *Swede* claim, above Lambert & Stewart's, is said to have paid well all summer; the owners have drifted in several hundred feet and are still working. The gold they get is coarse, one piece taken out was worth $12.60. Amberty staked a bench claim, but did not do much gravel-washing, having been occupied building a chute and putting in boxes until winter set in. Almost the first shovelful he tried gave him one nugget worth $23.40. McLeod & Mitchell, of Vancouver, started working in a small way on a claim east of the *Pogue*, and in about two weeks took out $250, but, finding that the most profitable way to work would be to hydraulic, decided to put in pump, pipe, and hose, and to get back to mining early in the spring. Kane & Jamieson, from Seattle, started opening up the old *Swan* ground by carrying Ward creek in a flume, but frost and snow coming with the winter necessitated their knocking off until next season. Some others worked in the neighbourhood, but were not successful. However, prospects are good that next season will see more placer-mining being done on Granite creek and tributaries than for years, and more gold and platinum being recovered.

Reports have been published of successful placer-mining on Tulameen river, above the town of Tulameen, but no particulars were obtained. One man is said to have won $200 in gold and platinum in a couple of days, but this report was not verified.

General.—Little is known of the work done on mineral claims on Treasure mountain, nor in other parts of the old Summit Camp, near the head of Tulameen river. Nor does there seem to be any news obtainable of work in Law's camp or other parts of these outlying regions.

Coal-mining.—The Princeton Coal and Land Company did not sell so much coal in 1914 as in 1913, having, in common with other coal-producers, felt the effect of a smaller market. An estimate of the quantity mined last year is placed at 17,517 tons. The development-work done in the company's mine during the period under review consisted of a new slope 400 feet long, with a counter 320 feet, and opening Nos. 4 and 5 East Main levels off slope; No. 4 and counter were each driven 500 feet, and No. 5 and counter a shorter distance. An 11- x 6-inch vertical steam-engine and a 50-kw. Westinghouse generator were added to the machinery equipment, and a pole-line was erected between the power-house and Princeton to serve as a transmission-line for the electric lighting in the town.

At the Coalmont Colliery about 3,500 feet of work was done in underground development during the year. It is reported that in the latter part of March there were discovered two seams of coal, one 7 feet and the other 5 feet in thickness, with a parting of 1 inch of bone, giving practically a 12-foot working seam of coal. A 50-horse-power steam-boiler and a 35-horse-power engine, with fan attached to ventilate the workings, were the only additions to equipment during the year. From April 1st to the end of the year more than 4,000 tons of coal was hauled by horse-teams three miles from the mine to the railway. A transportation system is under consideration, but whether an aerial ropeway or a gravity surface tramway will be decided on is not yet known.

No production in 1914 has been reported from the United Empire property, about four miles from Princeton, from which some 1,700 long tons was mined in 1913.

Nicola Valley.

As far as known, no production of metalliferous minerals has been made in the Nicola valley this past year, and, except that assessment-work is done on a number of claims, the mineral deposits of the district remain undeveloped. The gypsum-deposit near Merritt was not worked this year.

The coal-mines near Merritt have had a very poor year as far as output is concerned, which was not over half of that of the previous year. Further details of the coal-mines are given in another part of this bulletin under the heading of "C[illegible]."

Vernon Mining Division.

For the first time in years there has been a mineral production from this district, the *St. Paul* mine having treated about 150 tons of ore from which was recovered about 35 oz. gold.

Kamloops, Ashcroft, and Yale.

Very little mining activity has been apparent in these Divisions during the past year, outside of the necessary assessment-work. So far as is at present known, the only mine that has shipped any ore this year is the *Iron Mask*, in the Kamloops Division, which is reported to have sent some 290 tons of copper ore to Trail.

In the Yale Division, near Hope, some work was done on the *Aufess* and adjacent properties, but it is believed no output has been made.

Some desultory placer-mining is always done in these Divisions, but the amount of gold recovered is small.

The railway just about completed through this district has noticeably stimulated prospecting and development, but it is too soon as yet to expect any tangible results.

LILLOOET DISTRICT.

The Pacific Great Eastern Railway through this district is almost completed, and will open up a large territory which, from samples, is known to be at least mineral-bearing, but formerly the lack of all transportation facilities deterred even the development of the various showings found; with transportation available it is expected that commercial ore will be proven. A small amount of placer gold has been recovered at various points, and the Golden Dream Mining Company has operated placer leases on Bridge river and Cadwallader creek.

The only lode mine known to have made any output is the *Coronation*, on Cadwallader creek, which milled some 120 tons of ore and recovered over 230 oz. in gold and about 400 oz. in silver.

A force of about eight men was employed all the year, a winze was sunk for about 40 feet from the old workings, and considerable development was done on the *Countless*.

Development was carried on at the *Pioneer* by Ferguson *et al.*

The *Wayside* was developed all season by Paxton, but as yet no output has been made.

COAST DISTRICT.

There are six mining divisions covering the region here to be noticed under the heading of the "Coast District." The chief mineral production has been of copper ore and structural materials in the Vancouver Division; of gold-copper ore and coal in Nanaimo Division; and of lime, cement, and clay products in Victoria Division. In addition, there has been development of mining properties in various other parts of the large area of country comprising the district, but not many of these properties at present give promise of becoming commercially productive in the near future.

Vancouver Mining Division.

Of the metalliferous-mining properties of Vancouver Mining Division, only the *Britannia* has as yet been productive in large degree. Notes on mineral claims on Bowen island and on others on the Indian river may be found in the Annual Report of the Minister of Mines for 1913; also official information relative to the geology, etc., of the *Britannia* property. A report by the Assistant Mineralogist on a group of zinc-ore-bearing claims on Lynn creek was printed in that Report. In

1914 the only noteworthy production of metalliferous minerals was that made by the Britannia Mining and Smelting Company, Limited, concerning which some particulars follow.

Britannia Mining and Smelting Company.—The estimated production and the gross metal contents of the ore for 1914, together with corresponding figures for 1913, for purposes of comparison, are shown in the following table:

	Estimate, 1914.	1913.
Ore mined, tons	220,174	215,589
Ore milled, tons	240,272	215,121
Crude ore and concentrates shipped, tons	38,760	45,009
Gross contents—		
Gold, oz.	200	89
Silver, oz.	70,000	72,200
Copper, lb.	12,000,000	[illegible]

The demoralisation of the copper market last summer resulted in a curtailment of production by about 50 per cent. as from the middle of August, also in a practical suspension of important construction-work previously in progress.

Much underground development-work was done in 1914, chiefly in drifting, crosscutting, and raising.

The following is an outline of the progress made to the end of 1914 with the construction and other improvements the company is making with the object of largely increasing its production of ore:—

New Concentrating-mill.—The framing and roofing-in of the first 1,000-ton unit of the new concentrating-mill, which is eventually to have a capacity of 2,000 tons a day, has been completed and the machinery (the larger part of which for the full plant is now on the ground) has been placed under cover. The grading and excavation for the second unit has also been completed. The storage and handling of the various products from the present 800-ton mill and the larger new mill have been greatly simplified by driving underneath the mill-site a tunnel from which three 6- x 10-foot raises have been made down which to pass the concentrates, etc. An electric railway is operated through this tunnel, and connection with the new bunkers on the shipping-dock is made over a trestle.

Transportation System.—The *Britannia* crosscut adit, which is the 2,200-foot level of the mine, has been driven at an elevation that is 1,196 feet below the lowest (1,050-foot level) workings of the company's *Fairview* mine; its dimensions are 9 x 12 feet in the clear, and it has been driven a total distance of 4,836 feet from its portal. A 3-foot-gauge track, with 45-lb. steel, has been constructed the full length of the adit, which will in the near future be the main outlet from the mine, after which the three-and-a-half-mile aerial tramway, which has for years been the chief means of transportation between Britannia Beach and the upper mine camp, will be used as an auxiliary.

The working-shaft that is being driven vertically from the 2,200-foot level, starting at a distance of 3,922 feet from the portal, to connect with the present productive workings above, has outside measurements of 10 x 20 feet, and is divided into three compartments, of which two for hoisting purposes are each 6 x 7 feet 6 inches, and one, a manway, is 3 x 7 feet 6 inches. This shaft is now within 217 feet of being completed; in addition, much work has been done in cutting stations at intermediate levels, and in crosscutting to connect with a rock raise also put up from the 2,200-foot level. This raise, which will constitute the chute and storage-bin for the ore, is 8 x 12 feet and 1,268 feet in length; it was holed through to the 1,050-foot level on October 24th, when work in it was stopped pending completion of the main working-shaft, after which installation of the machinery, already received, will be proceeded with. The machinery plant includes

a 20,000-lb. double-drum electric hoist, to be placed on the 1,050-foot level for operation of cages, etc., in the shaft, and a Gates crusher, to be installed in the rock raise at a height of 400 feet above the 2,200-foot level.

From the mouth of the tunnel from the mine, which is 2,100 feet above sea-level, the ore will be hauled by electric locomotives over three and a half miles of side-hill railway, having a maximum grade of 3 per cent. and leading to the head of an incline, the elevation of which is 1,600 feet. During 1914 grading and track-laying of the railway was practically completed, and the incline, which will connect the railway with the mill-bins at Britannia Beach, was graded through with the exception of a cut at the upper end. This incline, 5,500 feet in length and of an average grade of approximately 30 per cent., will be standard-gauge and double-tracked with 56-lb. rails; it will be operated by a winding-engine and 20-ton skips, which latter will convey the ore from the bins at the head of the incline to the concentrator at the Beach.

Power.—As the first step toward the provision of additional power for the larger operations, the company is supplementing its present 500-kw. auxiliary steam-turbine with a 2,000-kw. unit of the Fraser & Chalmers type, the arrival of which at the Beach has been delayed until spring. Meanwhile, the remainder of the installation, consisting of two 500-horse-power Babcock & Wilcox high-pressure steam-boilers, was completed in December, necessary arrangements having been made in the way of stack and breeching for the addition of a third similar boiler at an early date.

During last summer the company greatly increased the capacity of its Utopia storage-dam at the head of Britannia creek, to which recourse is had for supplying the Tunnel and Beach hydro-electric plants during periods of shortage of water from ordinary sources of supply.

General.—Among the numerous other improvements made during the year are the undermentioned: There were constructed new concrete tanks for slimes and Hancock jig and Minerals Separation flotation process concentrates from the old mill; additions were made to the old mill plant of Hardinge pebble-mills, Allis-Chalmers tube-mill, Butchart tables, slime-pump, water-wheels, and other new equipment; more buildings were erected, including eleven dwellings for employees, some with five and others with four rooms; a large bunk-house was built at the Beach; all buildings on the property were painted; an up-to-date laundry, electrically operated, was completed, this to be run in connection with the Britannia stores; a new wagon-bridge was constructed over Britannia creek; further provision was made for the recreation and amusement of employees by adapting a large building for use as a roller-skating rink and dance-hall; modern fire-fighting apparatus was put in, and three pulmotors (for automatic resuscitation with oxygen) were purchased and men instructed in their use; and, generally, much else was done for the more efficient operation of the mine and the concentrating-mills, and the accommodation and comfort of the company's many employees.

Nanaimo Mining Division.

Texada Island.

The only metalliferous mining of importance done in 1914 in Nanaimo Mining Division was that of the Tacoma Steel Company at its *Marble Bay* mine, near Vananda, Texada island. Information concerning coal-mining operations in this Division has already been given. Notes on several metal-mines and the lime-quarries on Texada island, comprising a report by D. G. Forbes, were printed in the Annual Report for 1913.

Marble Bay Mine.—Ore production was discontinued shortly after the war affected the metal markets, so that since the middle of August the output was restricted to the shipment of the small quantity of ore got together in cleaning up the stopes before confining operations to development-work only. The quantity of ore estimated to have been shipped in 1914 to the smelting-works at Tacoma was 14,000 tons, and the approximate production of metals was: Of gold, 2,700 oz.;

silver, 17,000 oz.; and copper, 760,000 lb. During the latter half of the year three shifts of men were employed deepening the shaft 500 feet from No. 10 level, giving 200 feet of depth below No. 13 level. Connection between Nos. 10 and 13 is by a winze; No. 15 level is to be opened from the shaft, from which it will be necessary to drive about 750 feet to reach the ore-bodies, the occurrence of which 200 feet below No. 13 has been proved by diamond-drill. The cost of handling the ore will be less after the new development-work outlined above shall have been done.

Besides the shaft-sinking, more than 1,000 feet of underground work in drifting, etc., was done in 1914, while the diamond-drill holes gave a total of more than 4,000 feet of that class of work, with results that have demonstrated the advantage and profit derivable from the use of the diamond-drill. A second drill has been purchased. Surface improvements made in 1914 include the erection of a new office.

Vancouver Island.

Work was continued on the *Kallapa* mine, situated on Mears island, in the Clayoquot Mining Division, and about 1,300 tons of ore was shipped to Tacoma; the metal contents were nearly 500 oz. of gold, 3,000 oz. of silver, and 48,000 lb. of copper.

More development-work was done on the *Merry Widow* and *Old Sport* groups, in Quatsino Mining Division, notes of which were included in the 1913 Annual Report. Efforts were made by those concerned to secure the capital requisite for construction of a railway or tramway from these properties to tide-water, but, so far as known, this work has not yet been undertaken.

Some prospecting was done on copper-ore claims on the Valdes group of islands, off the east coast of Vancouver Island, but no commercial production of ore was made.

Coal-mining was continued to the extent the market demands required, as shown on earlier pages of this bulletin. The lime, cement, and clay-products manufacturing industries of the Island have also been noted earlier.

PROFITS OF THE MINING COMPANIES.

The following is a list of dividends paid by metalliferous-mining companies during the calendar years 1912, 1913, and 1914:—

Name of Company.	1912.	1913.	1914.
British Columbia Copper Company, Greenwood	$177,512	$ 99,756	.....
Consolidated Mining and Smelting Company, Trail	232,176	348,264	$ 464,376
Granby Con. Mining, Smelting, and Power Co, Grand Forks	.....	399,911	449,955
Hedley Gold Mining Company, Hedley	300,000	300,000	300,000
Le Roi No. 2, Rossland	29,400	43,200	.....
Standard Silver-Lead Company, Silverton	425,000	650,000	475,000
	$1,284,089	$2,390,131	$1,689,331

The amount of $1,689,331 shown above as distributed profits by no means represents the total of net profits earned in 1914 by the metalliferous-mining companies operating in the Province. For instance, the Hedley Gold Mining Company expended $200,000 on a new hydro-electric power system, which amount was taken out of its fund of accumulated net profits. It is known, too, that several others of the larger companies made important additions to plant and equipment, or did much development-work preparatory to enlargement of operations and of earning powers in the future. Further, it should be kept in mind that, while profit-earning was generally restricted to seven months of the year up to the outbreak of the European war, expenditures for upkeep, and in many

cases for development-work, were provided for out of previous surplus net earnings. On the whole, then, results for the year were encouraging, and warrant confidence that after a return to normal conditions metalliferous mining in British Columbia will show steadily increasing improvement in regard to profit-earning results.

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